MINING CONGRESS JOURNAL

FFICIAL

UCATION

no track is better *than its weakest joint*

One bad joint can raise havoc on a main haulage track. A derailment or delay caused by a rail replacement may cause serious congestion in your entire transportation system.

Thermit Welding puts a definite end to all joint maintenance. No more renewing plates, bonds and lock washers which are frequently eaten away by corrosion. No need to install copper return circuits.

Thermit Welding eliminates battered and cupped rail ends — the chief item in maintenance cost. Your entire track is fused into a smooth, continuous unit and the welded joints are actually stronger and have better electrical conductivity than the rail itself.

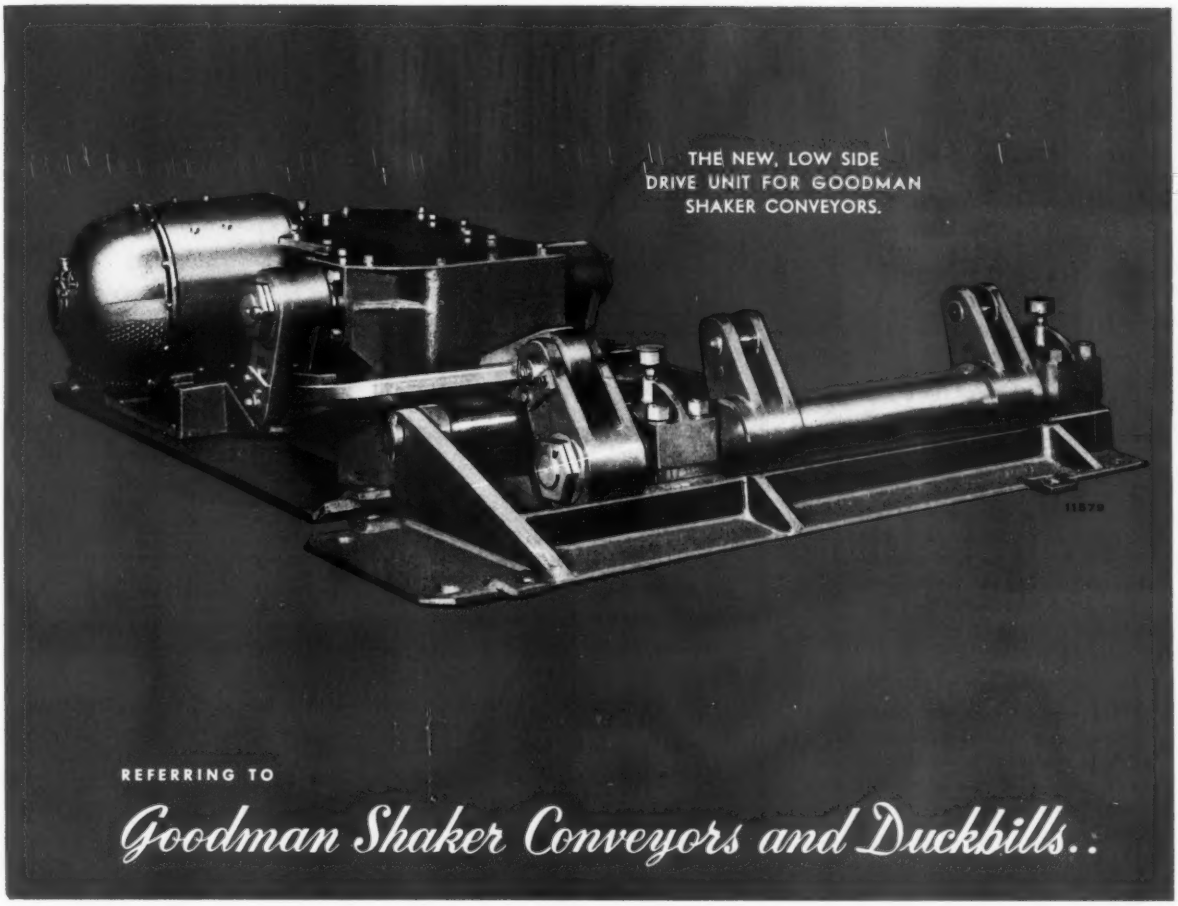
Investigate Thermit Welding for your main haulage track. It will bring increased rail life, reduced track maintenance and substantial power savings.

Send for booklet, "Continuous Rail for Main Haulage Tracks," which describes the application of Thermit Welding in detail.

Thermit ★ rail ★ Welding

Ask for Murex Heavy Coated Electrodes for electric arc welding. Special rods for building up and surfacing.

METAL & THERMIT CORPORATION
120 BROADWAY NEW YORK
ALBANY • CHICAGO • PITTSBURGH • SO. SAN FRANCISCO • TORONTO



REFERRING TO

Goodman Shaker Conveyors and Duckbills..

. . . let an experienced engineer give you *facts* as to what this equipment has accomplished in scores of mines and *figures* to show what it can do for you.

Continuous development and production, higher yield of tons per man employed, rapid extraction under bad top, the mining of areas previously unworkable, and low initial cost are important among the many advantages he will explain to you.

Your inquiry will be welcomed.

THE TYPE A AUTOMATIC DUCKBILL

GOODMAN MANUFACTURING COMPANY

HALSTED STREET AT 48TH CHICAGO, ILLINOIS

Editorial Director
JULIAN D. CONOVER

Editor
RUSSELL C. FLEMING

Associate Editors
A. W. Dickinson — P. D. McMurrer
G. B. Southward — H. L. Moffett
B. E. Chambers

Field Representatives
Frank W. Moran
James E. Neary, Jr.

MINING CONGRESS JOURNAL

Vol. 27 AUGUST, 1941 No. 8

Magnesium is in the news. If estimated requirements are met the country will come out of this emergency with a magnesium metal output in excess of 200,000 tons annually, and magnesium will be among the most plentiful of industrial metals. Mr. Franke gives in this issue a full discussion of the status of the industry, sources of materials, and production methods.

The experience of the Northwestern Improvement Company in the Roslyn field in improving its coal-cleaning practice will be of great interest, since many other companies have similar problems.

Exploration geophysics continues to find new fields of application. Sherwin Kelly describes the results of a geophysical survey on a uranium-vanadium ore area in Colorado.

These and other equally worth while features are on the table. See menu at the right.

"Buy Coal Early. Don't get caught with your heating plants down!"

TABLE OF CONTENTS

ON THE COVER: Flasks of quicksilver ready for shipment. Photo by Moulin, San Francisco.

Page

EDITORIALS:
The 35-Hour Week and the National Emergency 15
Manganese and Chromium—or Candy and Chewing Gum? 15

OUR MAGNESIUM RESOURCES 16
By Herbert A. Franke

FIVE YEARS OF COAL CLEANING EXPERIENCE 23
By Earl A. McMillan

GEOLOGICAL STUDIES OF VANADIUM-URANIUM DEPOSITS BY GEOPHYSICAL EXPLORATION METHODS 27
By Sherwin F. Kelly

CONVEYOR MINING AT THE SIMPSON CREEK COLLIERIES COMPANY 36
By Joseph M. Cannon

ST. LAWRENCE PROJECT AND THE MINING INDUSTRY 40
By Julian D. Conover

WITH THE COAL DIVISION OF THE AMERICAN MINING CONGRESS
Steel and Timber Roof Supports for Mine Entries 47
By A. R. Joyce

WHEELS OF GOVERNMENT 51

GETTING READY FOR THE SAN FRANCISCO CONVENTION 54

PERSONALS 57

NEWS AND VIEWS 59

MANUFACTURERS' FORUM 65

Opinions expressed by authors within these pages are their own, and do not necessarily represent those of the American Mining Congress

Published monthly. Yearly subscription, United States and Canada, $2.00. Foreign, $4.00. Single copies, $0.20. Entered as Second-Class Mail Matter, January 30, 1915, at the Post Office at Washington, D. C.

Member, Audit Bureau of Circulations

Copyright 1941 by
THE AMERICAN MINING CONGRESS
309 Munsey Bldg., Washington, D. C.

Howard I. Young, President — Edward B. Greene, Vice President
David D. Moffat, Vice President — Donald A. Callahan, Vice President
Julian D. Conover, Secretary

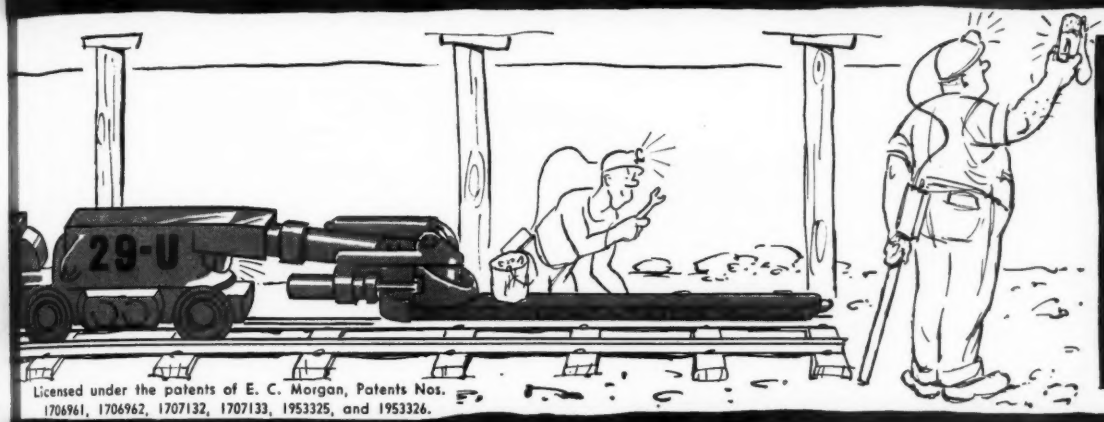
THE Big 3

29-U CUTTER

56-A DRILL

L-400 LOADER

a Great Team



Licensed under the patents of E. C. Morgan, Patents Nos. 1706961, 1706962, 1707132, 1707133, 1953325, and 1953326.

KERF the CUTTER:

I've cut the bottom, sides and top
This face will only need a pop.

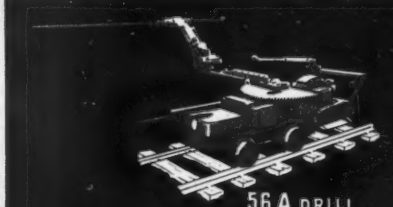
BERT the BOSS:

We'll have to widen out the dump.
It's never going to take this lump.

SELECTIVE CUTTING AND LOADING OFTEN PRODUCE HIGHER QUALITY COAL THAN HAND MINING METHODS

L 400 LOADER

THE JEFFREY MFG. CO.
COLUMBUS, OHIO

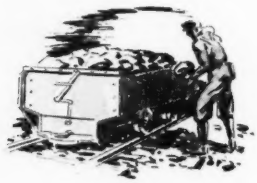


56 A DRILL

Pete tells why coal mining is better

"LOOKS like the country'll be needing all the coal we can get out for quite a spell. Kinda like old times. But we're sure getting it out in better shape than we used to. These new permissibles give us better lump.

"In the old days we shot a lot of fines. But Hercules service men soon showed us that permissibles could

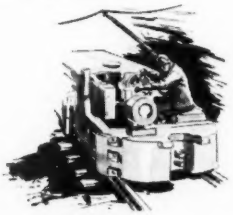


shoot lump—or any size—if you get the right explosives for the job, and shoot 'em right.

"The Hercules people were the first to make permissibles with a lot more sticks in a box. Then they kept improving them. Seems like that high-count business gave Hercules the idea for working out powders, and ways of shooting, that will lay down the coal in any mine just the way you want it whether it's for machine or hand loading.

"And Hercules hasn't got so many permissibles that you can't keep track of 'em either. With Red H*, Hercoal*, and Hercogel*, you can shoot most coal to suit anyone. But if you run into something that's extra special difficult, why Hercules has a powder to take care of that, too.

"I saw it figured out where these new powders that Hercules made first are saving the coal mines a million dollars a year on the cost of permissibles. And I wouldn't wonder a bit if that's right. They're improving their powders all the time, and the Hercules service men are always finding better ways to shoot the coal. No wonder the boss sticks to Hercules permissibles."



HERCULES POWDER COMPANY
INCORPORATED
934 KING STREET, WILMINGTON, DELAWARE
*Reg. U. S. Pat. Off., by Hercules Powder Co.

B-36

HERCULES

EXPLOSIVES AND BLASTING SUPPLIES

FROM THE
TECHNICAL
LIBRARY
OF
KOPPERS
THE INDUSTRY THAT SERVES ALL INDUSTRY

HOW TO GET LONGER LIFE FROM MINE TIMBERS

HOW TO CUT TIE COSTS

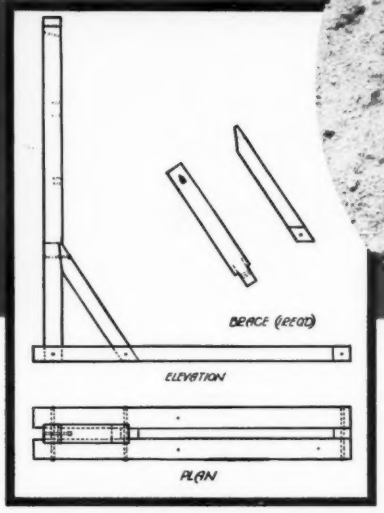
KOPPERS
ALL-IRON GATE VALVES

HOW TO GET INCREASED LIFE FROM COMPRESSOR RINGS

HOW TO EXTEND THE LIFE OF ROOFS AND STRUCTURES

Fill out and mail

These *PRESSURE-CREOSOTED* Integrated Trolley Poles Keep *TROLLEYS AND COSTS* PERMANENTLY IN LINE



These framing details and the photograph above, show construction. Ties, posts and braces were framed at the Wood Preserving Division Plant and then pressure-treated with creosote to assure maximum service life.

Engineers of the Hanna Coal Company worked out this simple and effective solution to a common problem in building outside track at the Piney Fork No. 1 Mine. The mine tracks follow the contours of the hills, and extend over several fills. During periods of heavy rainfall slides and earth movements are common, and with ordinary construction this would move tracks out of line, requiring extensive resetting of poles. By mounting each trolley wire support on two long ties, they are made an integral part of the track structure, and alignment is preserved regardless of track movements. For protection against decay, pressure-creosoted material was used.

WOOD PRESERVING DIVISION
KOPPERS COMPANY
PITTSBURGH · PENNSYLVANIA

use **KOPPERS** *products*

KOPPERS COMPANY
7019 Koppers Bldg., (19) Pittsburgh, Pa.

Please send me the literature checked:

Name.....

Title.....

Company.....

Address.....

- ☐ "Economics of Wood Preservation in Mines"
- ☐ "Ar-Moored Mine Ties"
- ☐ "Pressure-treated Poles"
- ☐ "Pressure-treated Timber"
- ☐ "The Painting of Creosoted Wood"
- ☐ "How to Measure the Quality of Pressure Treatment"
- ☐ "Fast's Couplings"
- ☐ "All-Iron Gate Valves"
- ☐ "Membrane Waterproofing"
- ☐ "Tar-base Paints"
- ☐ "Roofing Specifications"
- ☐ "How to Order Piston Rings"
- ☐ "Piston Rings for Diesels"
- ☐ "Piston Rings for Compressors"

Economy

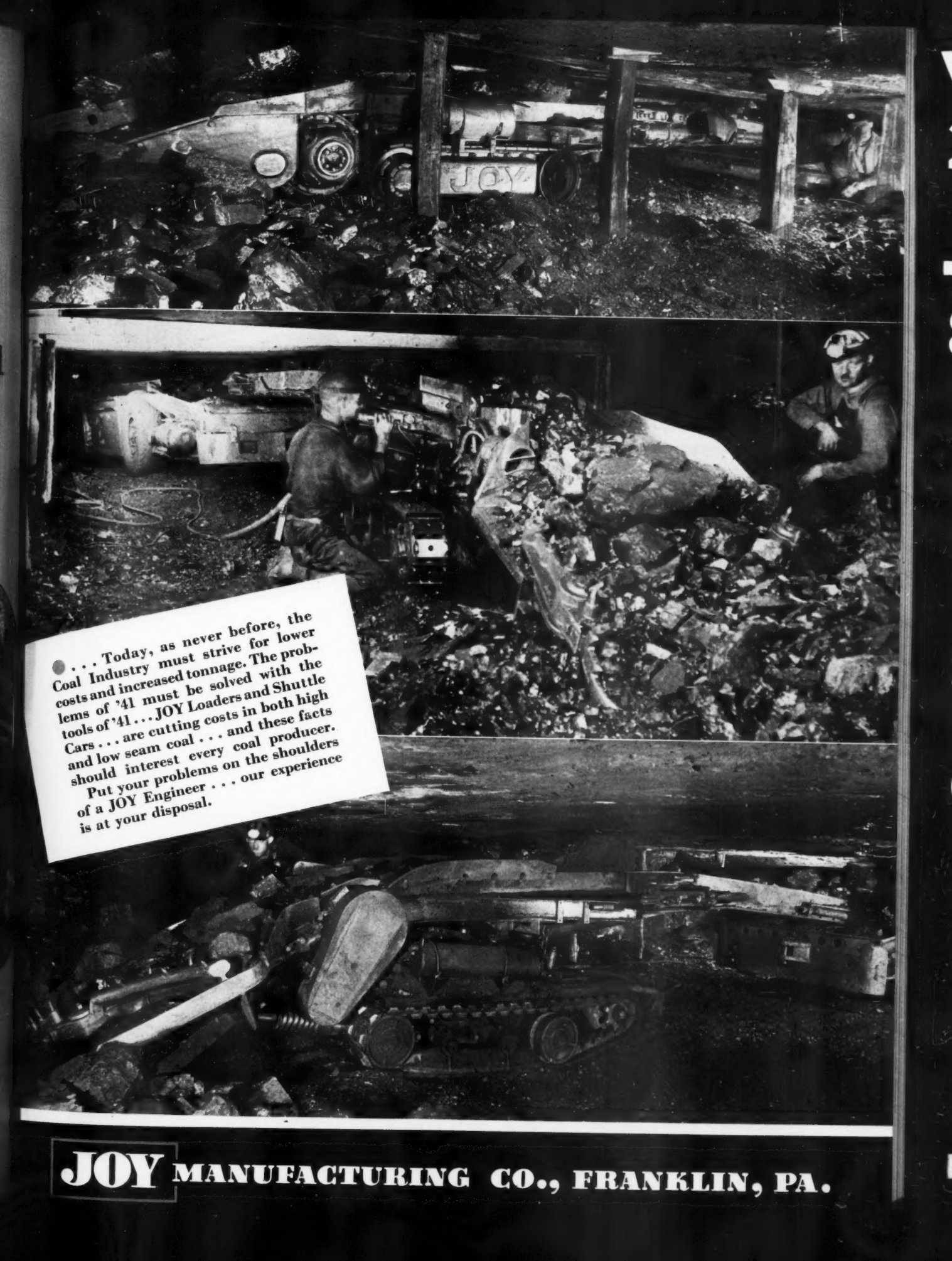
is the watchword of the mining world

and JOY loaders, shuttle cars and conveyors are essential to any modernization program!

Your costs must be competitive . . . and there is only one answer to today's problems—and that answer is modern time-saving cost-cutting equipment.

Consult a Joy Engineer

HE IS AVAILABLE AT YOUR CONVENIENCE



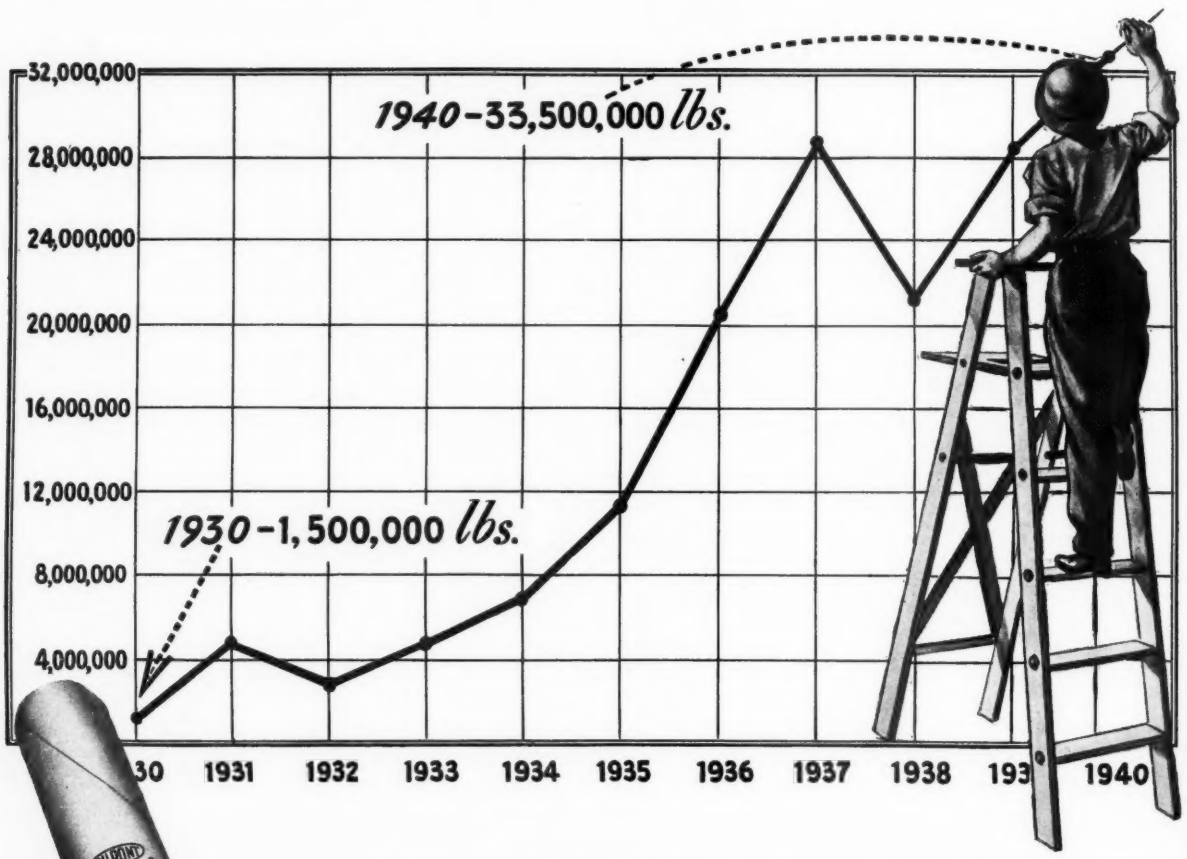
. . . Today, as never before, the Coal Industry must strive for lower costs and increased tonnage. The problems of '41 must be solved with the tools of '41 . . . JOY Loaders and Shuttle Cars . . . are cutting costs in both high and low seam coal . . . and these facts should interest every coal producer.

Put your problems on the shoulders of a JOY Engineer . . . our experience is at your disposal.

JOY MANUFACTURING CO., FRANKLIN, PA.

GELEX* POPULARITY

Increases 2,100% in Ten Years!



TAKE A LOOK at the sales figures if you want to see what's happened to GELEX. Since 1930—the year it was introduced—annual consumption has jumped from 1½ million to over 33½ million pounds. There are ample reasons for this popularity—time- and money-saving features that explain why more and more mines every year are switching to GELEX.

GELEX cuts blasting costs, because, stick for stick, it costs less than gelatin and its good water resistance permits its substitution in many cases for these more expensive grades. *GELEX is plastic and cohesive.* Hence it's easy to load and it stays loaded, even in slanting and vertical uppers. *GELEX detonates with high velocity,* assuring excellent fragmentation. And *GELEX produces minimum noxious fumes,* saving time at the face.

The sales figures speak for themselves. Let this endorsement of GELEX by *explosives users* be your guide to savings. E. I. du Pont de Nemours & Co. (Inc.), Explosives Department, Wilmington, Delaware. *TRADE MARK

DU PONT **EXPLOSIVES** *and* **BLASTING ACCESSORIES**

TO CUT ROPE COST...

KEEP YOUR EYE ON THE ROEBLING "4"

The Roebling "4" combine to give you the one thing above all that counts in wire rope service. And that is — utmost *overall* rope safety and minimum *general average* rope operating cost — economy based on your ropes *as a whole.*

ROEBLING
"Blue Center"
STEEL
WIRE ROPE

WIRE ROPE HIDES NO SECRETS HERE!

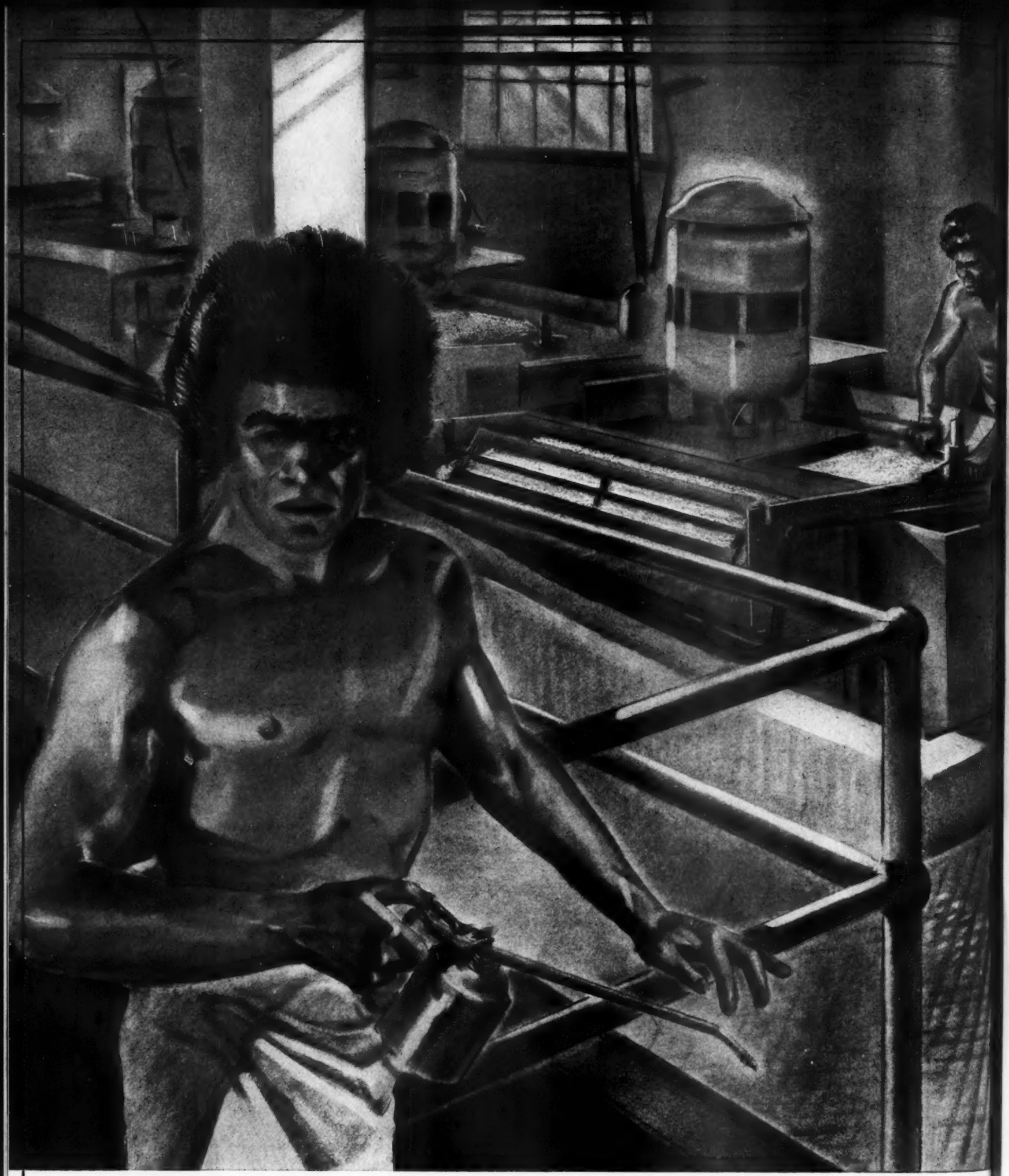
This wire rope fatigue machine is an outstanding example of Roebling's aggressive research and exceptional facilities.

It is the largest and most highly developed wire rope fatigue machine in existence, designed by Roebling for use in studying rope characteristics. With this machine is carried on a never-ending search into the wearing and fatigue qualities of wire rope under various bending and tension conditions.

ROEBLING 1841 1941 100th ANNIVERSARY

JOHN A. ROEBLING'S SONS COMPANY TRENTON NEW JERSEY

Branches or Principal Cities Export Division 19 Rector St. New York, N.Y., U.S.A. Cable Address "Roebling's" New York



AMERICAN CYANAMID COMPANY

Their fathers hunted heads

Down in the Fiji Islands—some 1600 miles out in the South Pacific—attended by a crew of native boys only a half generation removed from the jungle, a string of Fagergren Flotation Machines is helping to make a noteworthy record in the treatment of a highly refractory gold ore.

At this property values occur in sulphotellurides and also finely disseminated in pyrite, consequently roasting and grinding of the calcine is necessary prior to cyanidation. With this initial flow scheme, recovery was above 90%. Subsequently, flotation of the cyanidation residue and the return of the flotation concentrate to the roaster has reduced the final tailings by more than half—an overall extraction of 97%. The satisfactory performance of Fagergren Flotation Machines attended by unskilled native labor in so remote a spot attests to their dependability and metallurgical efficiency.

Fagergren Flotation Machines are but one part of Cyanamid Service to Metallurgy. From the laboratory examination of ore samples to the successful operation of the mill, Cyanamid stands ready to help at any step of your beneficiation problem.

To set up a new flow scheme or modernize an old one, the Cyanamid Ore Dressing Laboratory offers its trained personnel and its chemical, physical and microscopical facilities for solving your problem. In your own mill under your own operating conditions, Cyanamid Field Engineers can help in the practical application of the Laboratory's findings. Additionally, they can bring you the composite milling experience gained by working with mill men on every type of ore in every mining field of the world.

And to translate these services into your greatest economic benefit, Cyanamid offers a dependable source of supply of a complete line of cyanidation *and* flotation chemicals . . . often with the advantage of freight savings on combination shipments made promptly from strategically-located stock points throughout the world.

Now—as ever—feel free to command Cyanamid Service to Metallurgy.

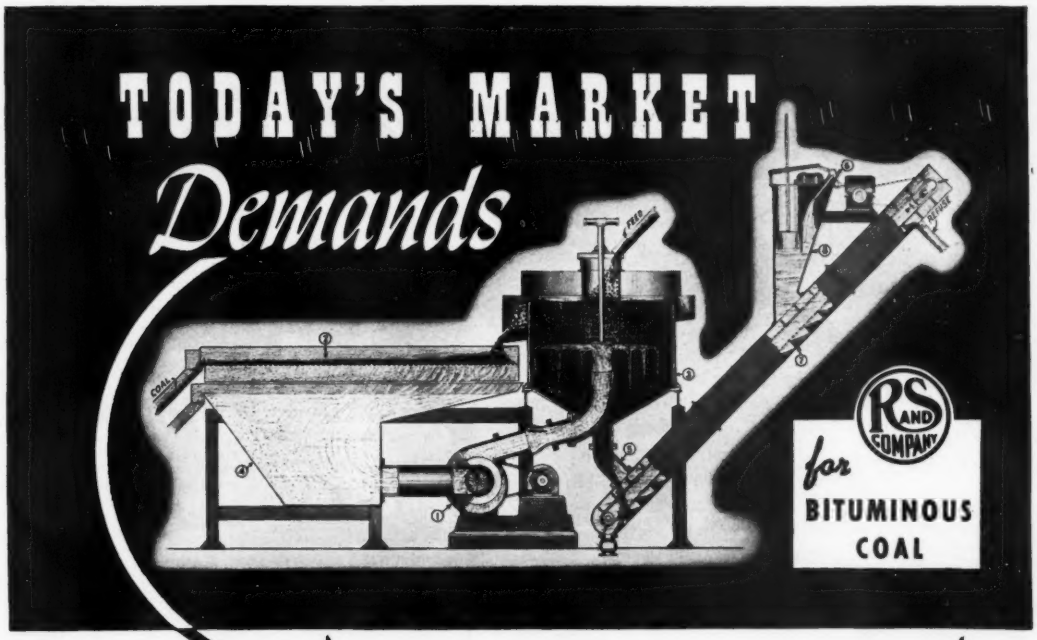
30 ROCKEFELLER PLAZA, NEW YORK, N.Y.

Wherever you need sturdy track

BETHLEHEM STEEL TIES

WHETHER it's put in permanently or temporarily, for light haulage or heavy duty, all track has this in common: it must be sturdy enough to stand up under its particular conditions of service. When you lay track on Bethlehem Steel Ties, light-weight or heavy-duty, you get the maximum possible ruggedness and reliability. Just as important, you realize savings with steel ties, not only through faster installation, but because they stand up longer and can be used in one installation after another. Whatever your own particular needs may be, there's a Bethlehem Steel Tie to fill them economically—from the light-weight No. 1 up to the ultra-heavy-duty Keystone No. 6 and No. 9.

BETHLEHEM STEEL COMPANY



point to **HYDROTATOR**

CLEANING PROCESS

HYDROTATOR Process has become the most favored method for difficult anthracite washing problems. With the recent Roberts and Schaefer Company development of a specialized unit for fine coal washing, the bituminous operator may now be equipped to meet the present market requirements. Hydrotator Process assures maximum efficiency in recovering uniformly prepared coal for steam or by-product uses.

The performance of the bituminous unit has been proven in actual operation, and offers these desirable advantages as well.

1. ***The operating costs are low***
2. ***The water requirements are small***
3. ***The operation is fully automatic***
4. ***The output is uniform***
5. ***The investment required is reasonable because of high capacity per unit area.***

If you have a problem in fine coal washing you should thoroughly investigate the Hydrotator. Complete facilities are available for full scale testing of your own material. Make certain in advance the results that may be expected. Why not investigate the Hydrotator today in connection with your own problems of primary washing or recovery of present sludge and refuse losses.

A bulletin of descriptive literature, just off the press, is now available and will gladly be sent on request.

ROBERTS and SCHAEFER CO.

307 North Michigan Avenue, Chicago

P. O. Box 865
PITTSBURGH, PA.

P. O. Box 570
HUNTINGTON, W. VA.

...Just another job

"IS MACHINERY a good thing?" Honest people were asking that, yesterday. No one is asking it, today.

Today, every factory is a sanctuary—its whirring wheels, an anthem of hope — its cement, sacred — the men who run it, saviors.

For the battle is no longer between men—it has graduated into a gigantic struggle, to the death, between machinery and minutes! A struggle for which we are seasoned! A problem we, as a people, have been brought up on! An assignment we know we can lick. A tough task, yes—but one that is being done. American Mass Production looks on this as—JUST ANOTHER JOB!

Its smile of confidence spreads to the face of the Nation. Its steel is in our hearts.

LINK-BELT joins American industry, which it has so long served, in the firm resolve that "Government of the People, by the People, and for the People shall not perish from the earth."

★ ★ ★

Link-Belt is proud of its part in the national defense effort—approximately 80 per cent of our output today is direct or indirect defense material.

Essential defense work being fabricated in the Link-Belt plants includes orders for the Army, the Navy, the Anti-Aircraft Division, the Air Force, the munitions-producing plants—and, not the least important, the supplying of essential products to all American industry now working on defense equipment.

COAL IS DEFENSE

LINK-BELT COMPANY

METALS FOR DEFENSE

Chicago Philadelphia Indianapolis Atlanta Cedar Rapids Dallas San Francisco Toronto

MATERIALS HANDLING MACHINERY • MECHANICAL TRANSMISSION EQUIPMENT

8636-D

A JOURNAL FOR THE ENTIRE MINING INDUSTRY—PUBLISHED BY THE AMERICAN MINING CONGRESS

MINING CONGRESS JOURNAL

RUSSELL C. FLEMING
Editor

Vol. 27 AUGUST, 1941 No. 8

THE 35-HOUR WEEK AND THE NATIONAL EMERGENCY

IN THE defense agencies in Washington concern is being expressed over the problem of getting a sufficient supply of fuel from the coal fields overland by railroad, and up the Atlantic coast by sea-going colliers, to the New England states. Some officials have also been disturbed over the adequacy of transportation for placing requirements of solid fuel on the docks at upper Great Lake ports; although there seems little reason to question the facilities afforded by vessel transportation, with an enormous up-lake cargo space available in the greatest iron ore fleet which has ever moved through Sault St. Marie and the Straits of Mackinac. In discussing this fuel problem attention is likewise being given to the capacity of the coal mines to produce; and thereby hangs the tale of a strange situation coming down from the days of the NRA.

When the artificially generated enthusiasm, pressure and hysteria of NRA days were fading in the spring of 1935, a startling maneuver was perpetrated upon General Hugh S. Johnson, the administration, and the consumers of the United States in suddenly limiting the work-week in the mines to five days of seven hours each. It is true that the demand for coal was not great, as the country was struggling up from the depression of 1932. But it can now readily be seen that it was most unwise so arbitrarily to limit the productive capacity of one of our most basic industries. The experience of previous business cycles was disregarded and, today, when a shortage of fuel will become increasingly acute with the approach of fall and winter, and the increased demands of the defense program call for more heat and more power, the mines are still working only seven hours a day and five days a week. In extenuation it is said that the mines may be double-shifted or triple-shifted, or that additional miners may be quickly secured. The practical rejoinder is that a great many of the mines are already running double or triple shift, and there is not an adequate supply of skilled and able-bodied, underground workmen to permit the further application of such measures.

The President of the United States has by proclamation declared the existence of a full state of national emergency, and government officials, fuel consumers and the public are engaged in a major defense effort which calls for the maximum production of necessities. Every other mining industry in the United States is working in eight-hour shifts; there are many manufacturing plants which are working three eight-hour shifts. It is anomalous that under these circumstances the coal mines should remain on a seven-hour shift basis; it is certain that an eight-hour workday would not be too much at the present time and under the present conditions.

MANGANESE AND CHROMIUM—OR CANDY AND CHEWING GUM?

THE House Committee on Ways and Means, in a last-minute "polishing up" of the 3.5 billion dollar revenue bill, to which it had already devoted three months of arduous work, eliminated an excise tax on candy and chewing gum.

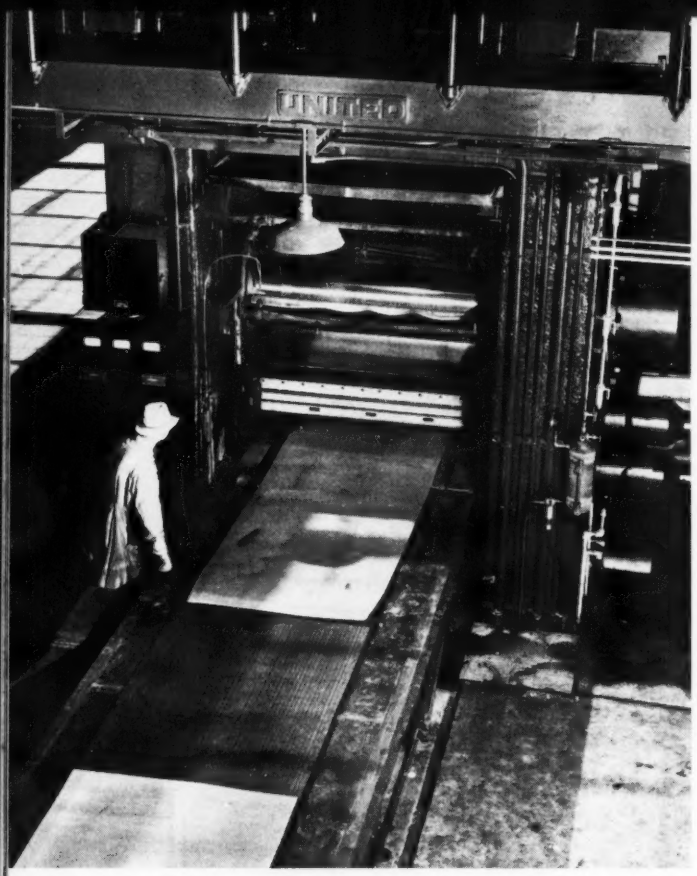
The measure, designed to finance as much as possible of our defense effort, was framed in part with a view toward encouraging vital defense production and levying on consumer goods not essential to defense. What the reasoning was for the removal of the taxes on confectionery we are unable to say. Perhaps the committee decided that our defense efforts needed them in greater quantities. But in any case the committee felt they had to restore the revenue thus lost. Where to turn?

In its dilemma the committee chose to impose a further tax on mines producing tungsten, quicksilver, antimony, manganese, chrome, platinum and tin—those strategic metals vital to defense and in which the country is normally so deficient that every encouragement should be given to their production. This it did by striking the exemption from the excess profits tax adopted by Congress in 1940 as a specific means of stimulating production.

It is notable also that beer and tobacco have remained free from further tax. In all common sense, does it not seem reasonable that candy and other luxury consumer goods should bear a larger share of the tax burden of defense rather than the strategic minerals which we must have at any cost?

After the Congress last year announced the exemption from this particular tax, which would have borne with crushing weight on those undertaking the risk of developing new mines and processes of treatment, ordinary good faith should bar the sudden elimination of this exemption without warning. Further, the action contradicts the efforts of the R.F.C., which has been attempting to encourage the development of our domestic resources by lending capital for the purpose; and the Metals Reserve Company, a subsidiary of the R.F.C., which has been purchasing all possible supplies of these metals at prices which are in effect based on the exemption of the mines from the excess profits tax. It nips in the bud many small prospective producers which in the aggregate might contribute substantially to defense requirements.

If this arbitrary attempt to strike the present exemption from the law stands, our defense efforts will lose large tonnages of sorely needed metals and the government will lose revenue rather than gain it. Which will our people prefer in the present emergency—tungsten, quicksilver, manganese and chromite . . . or candy and chewing gum?



Rolling magnesium alloy sheets at Midland, Mich., plant, Dow Chemical Co.

OUR MAGNESIUM RESOURCES*

By HERBERT A. FRANKE
Metal Economics Division
Bureau of Mines

Startling in magnitude and in implication for the future is the recent announcement from the OPM in Washington that the requirements of this country in magnesium metal are expected to reach 400,000,000 lbs. annually by the end of 1942. This is 62 times the 1939 consumption and is, for instance, equal to about 28 percent of the domestic copper production for 1939.

Is the country in a position to furnish, and from where, raw materials for this production? This article is a complete review of the magnesium situation as to production, sources of supply and plans for the immediate future.

\+ + +

EXPANDED national defense and lend-lease programs will require the production of approximately 400,000,000 lbs. of magnesium by the end of 1942! The Office of Production Management made this startling announcement in June, 1941—startling because it involves a 32-fold increase over 1940 output, or about 400 times as much magnesium metal as was ever made or used in the United States in any year before 1933. Since this announcement, industry and Washington defense agencies have worked feverishly on plans to make possible this enormous increase in domestic output.

U. S. Production of Magnesium Started During Last World War

Commercial domestic production of magnesium dates from 1915, when imports from Germany were cut off and American firms were obliged to undertake a production program to meet the war needs of the Allies. In those days, the metal was used chiefly for its pyrotechnic and chemical properties, being employed in tracer bullets, flares, and photographic flashlight powder and as a deoxidizing agent in nonferrous metallurgy. A small quantity also was consumed as an ingredient in aluminum-rich alloys. Production rose from 87,500 lbs. in 1915 to a record 284,118 lbs. in 1918. After the armistice the industry declined sharply, and output did not exceed that of 1918 until 1926, when 322,650 lb. of magnesium were sold or used. During this period, the price of the metal dropped from $5 to 80 cents a pound. In 1926 the demand for magnesium as a constituent in strong, corrosion-resistant aluminum-rich (duralumin-type) alloys increased, and in 1928 the use of magnesium-rich alloys as a structural material also began to assume some importance. Sales of magnesium rose from 530,782 lbs. in 1928 to 908,351 in 1929. The upward trend in consumption of magnesium since then is shown in the table on the opposite page.

Use Has Expanded Largely in Past Few Years

Only since 1933 has American industry consumed more than a million pounds of magnesium a year. The two great uses that have contributed most to the expansion in consumption since

* Published by permission of the Director, Bureau of Mines, U. S. Department of the Interior.

APPARENT CONSUMPTION OF PRIMARY MAGNESIUM IN THE UNITED STATES, 1930-40, IN POUNDS

Year	Sales	Imports	Exports	Apparent Consumption[1]
1930	559,631	5,689	[2] 105,000	460,000
1931	580,463	2,454	[2] 130,000	453,000
1932	791,699	935	[2] 85,000	708,000
1933	1,434,893	575	[2] 210,000	1,225,000
1934	4,249,838	661	[2] 1,150,000	3,100,000
1935	4,241,218	884	[2] 1,070,000	3,172,000
1936	3,903,312	1,126	[2] 525,000	3,379,000
1937	4,539,980	1,321	[2] 325,000	4,216,000
1938	4,819,617	60	[3] 2,100,000	2,719,700
1939	10,650,121	76	[3] 4,200,000	6,450,200
1940	12,823,633	.....	[4] 1,668,765	11,154,868

[1] Does not consider fluctuations in consumers' stocks and metal derived from scrap.
[2] Official data or reliable estimates not available, figures based upon magnesium reported imported from the United States to the United Kingdom and other countries.
[3] Based upon reliable estimates.
[4] Exports of metal totaled 1,718,444 pounds, including 49,679 pounds of magnesium alloy.

ACTUAL CONSUMPTION[1] OF PRIMARY AND SECONDARY MAGNESIUM IN 1940, BY USES

Use	Pounds	Use	Pounds
Structural products[2]	7,363,200	Scavenger and deoxidizer	361,600
Aluminum alloys	3,556,500	Pyrotechnics	43,500
Zinc alloys	68,000	Chemicals	70,200
Other alloys	17,600	Other	50,400
		Total	11,531,000

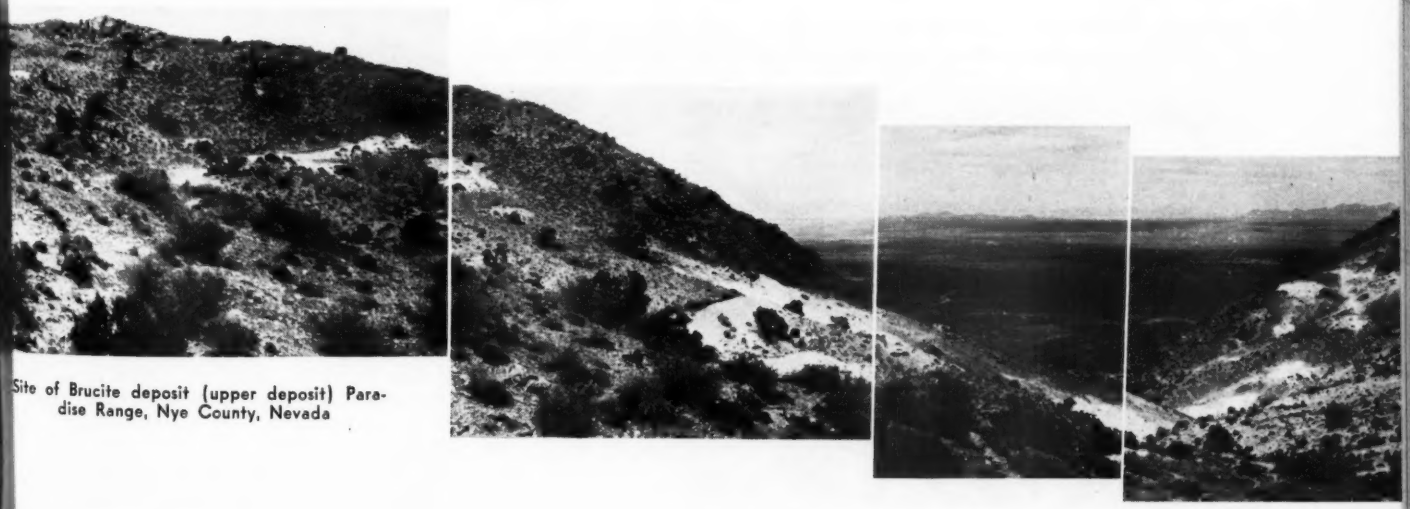
[1] In addition to the 11,154,868 pounds of primary magnesium delivered by the producer to domestic industry in 1940, consumers withdrew metal from stock and purchased and consumed old and new scrap totaling 376,132 pounds.
[2] Castings, sheet, extruded shapes, forgings, etc.

1933 are: (1) The use of magnesium-rich alloys as a material of construction and (2) the use of magnesium as a constituent of aluminum-rich alloys. Magnesium also is employed (1) as an ingredient in zinc and other alloys; (2) as a deoxidizer and scavenger in removing bismuth from lead and in cleansing copper, brass, bronze, tin-lead solder, nickel, nickel-silver, Monel metal, and aluminum; (3) as a powder in the manufacture of pyrotechnics, such as ammunition and flares; and (4) as a catalytic agent in the formation of complex organic compounds. At one time most of the magnesium consumed was divided among the three last uses.

In 1940, manufacturers of magnesium-rich alloy castings, sheet, extrusions, and other shapes for the aircraft, automobile, and other industries utilized 64 percent of all the magnesium consumed in the United States. Makers of aluminum alloys took 31 percent, of which a large part also went to the aircraft industry. The remainder, 5 percent, was employed as a scavenger and deoxidizer in the metallurgical industry and in zinc and other alloys, chemicals, pyrotechnics, and other applications.

Technologic Progress Has Resulted in Increased Consumption

Technologic progress in the production and fabrication of magnesium and its alloys was indirectly responsible for the great advance in consumption of the metal in 1939 and 1940. Although magnesium alloys long have been recognized for their lightness and good machinability, consumption has been restricted because aluminum and other materials have been available at a lower price, with greater resistance to corrosion, superior mechanical properties, and better-known fabrication technique. During the last few years, however, the magnesium industry has overcome many of its handicaps and made possible broader utilization of the metal. The price of primary magnesium has declined from 80 cents a pound in 1926 to 30 cents in 1931 and to 27 cents in 1939. Industrial research engineers and scientists have improved the resistance of magnesium alloys to corrosion to a high degree by elimination of chloride flux inclusions, development of better alloy combinations, control of harmful metallic impurities, furtherance of new chemical surface treatments, and by fostering the use of better paints and painting schedules. The mechanical properties of magnesium alloys have been improved by new alloy compositions, especially those of high strength and improved chemical stability. Fabricating technique has been greatly advanced, particularly in the arts of rolling and stamping sheet, sand and die casting, and permanent molding and in gas, arc, and electric spot welding. During the last couple of years basic factors of design have



Site of Brucite deposit (upper deposit) Paradise Range, Nye County, Nevada

been improved, chiefly in regard to structural airplane subassemblies. These and other technologic advancements, plus the light weight, adequate strength, and good machinability of magnesium alloy structural products, have given the metal an importance equal to and above that of many other materials.

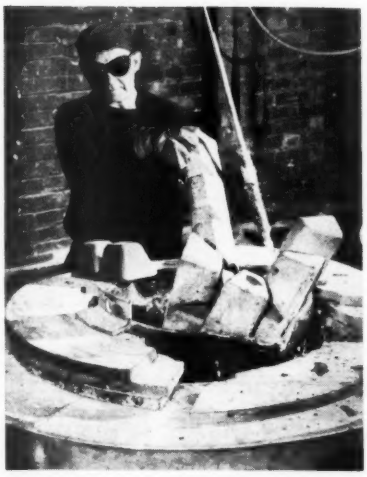
Of the 7,363,200 lbs. of magnesium used in the manufacture of magnesium-rich structural alloy products in 1940, 5,383,670 lbs. emerged in finished items. The remaining 1,979,530 lbs. (27 percent) were lost or burned in the manufacturing process. This high loss is due to the fact that magnesium oxidizes readily at temperatures above its melting point; however, continued improvements in melting, foundry, and fabrication practices should reduce this loss. The gross weight (or the weight of the magnesium plus its alloying constituents) in the finished magnesium-rich alloy structural products manufactured in 1940 totaled 5,916,120 lbs., of which 5,475,530 lbs. were sold or used. The latter included sand and permanent mold castings (chiefly the former), 73 percent; die castings, 13 percent; extruded products, 7 percent; sheet, 6 percent; and forgings and other structural products, 1 percent.

In 1930 only 114,464 lbs. of structural products were consumed. The demand grew slowly thereafter, reaching 975,640 lbs. in 1936 and 1,418,391 lbs. in 1937. Of the record 1940 consumption of structural products, the aircraft industry took 75 percent; automotive, 10; portable machine, equipment, and tool, 6; textile, 3; foundry equipment, 2; and all others, 3. The airplane industry has been the largest consumer of magnesium-alloy structural products for many years, but only recently did the Army and Navy lift very rigid restrictions on the use of magnesium-alloy parts in fighting planes. It is estimated that up to 1,000 lbs. of magnesium are now consumed in each plane.

Boom in Industrial Applications of Magnesium Existed Before Present Plane Program Started

The use of more magnesium per plane and the greatly expanded British and American aircraft program have actually been superimposed upon an existent boom in general industrial application of the metal. During 1940, manufacturers of textiles, shoes, carpets, rubber goods, optical apparatus, foundry equipment, business machines, motor trucks, and other civilian commodities found new uses for magnesium; however, just as these newly created demands were gaining importance, the aircraft industry began to increase its consumption of magnesium, and the shortage that developed discouraged the growing civilian use of the metal. After the emergency is over there will be more magnesium at a lower price than ever before, and these and many other new uses are expected to offer magnesium a promising future.

On March 3, 1941, the Office of Production Management invoked mandatory priorities on magnesium, allocating virtually all available supplies of the metal to defense needs. Nevertheless, it appears that aircraft and



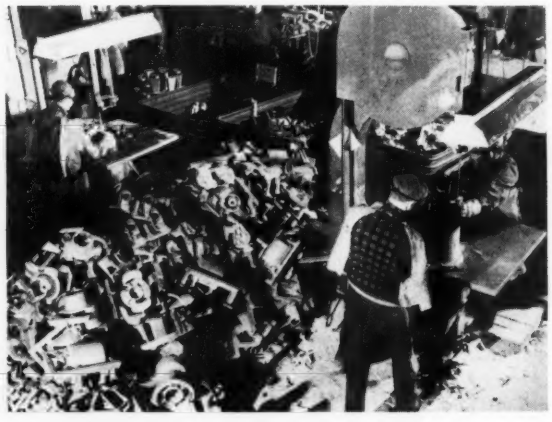
Charging magnesium ingots into a melting furnace. Buffalo plant, American Magnesium Corp.

Pouring magnesium metal into a ladle. Workman is adding fluxing material to prevent the magnesium from burning

MAGNESIUM-RICH ALLOY STRUCTURAL PRODUCTS [1] MANUFACTURED AND SOLD OR USED IN THE UNITED STATES, 1939-40

Product	1939		1940	
	Pounds	Value	Pounds	Value
Castings:				
Sand and permanent mold	1,321,080	$2,030,175	3,973,757	$7,345,050
Die	525,372	385,770	699,212	653,289
Sheet	180,896	116,287	322,664	246,476
Structural shapes, rods, tubing (extrusions)	308,443	185,746	410,912	349,123
Forgings	17,065	26,925	25,938	34,602
Other structural	3,404	2,553	43,047	134,251
Total	2,356,260	$2,747,456	5,475,530	$8,762,791

[1] Averaging 91 percent magnesium; remainder aluminum, zinc, manganese, etc.



Trimming gates and risers from magnesium sand castings to be used in aircraft. Buffalo plant of American Magnesium Corp.

other military demands for magnesium will be greater than the supply in 1941. The metal has achieved greater importance in the munitions industry, and in the United Kingdom and Germany probably as much magnesium is used for the manufacture of incendiary bombs as for aircraft. On every trip a large bomber can carry up to 2,000 of the 2-pound incendiary bombs, consisting of a magnesium-alloy case filled with thermite.

Proposed Annual Production End of 1942 is 62 Times 1939 Consumption

Seasoned as the American public had become by estimates of requirements in terms of millions and billions, it was surprised to learn that approximately 393,000,000 pounds of magnesium and 1,073,000,000 pounds of aluminum over that made in the peak year of 1939 must be produced annually to satisfy the foreseeable potential demand. The role of these two light metals in modern "blitz" warfare had not been fully realized before. Now it appears that the war may usher in an Age for Light Metals. The problem today is to expand domestic capacity rapidly enough to the 1,400,000,000-pound aluminum and 400,000,000-pound magnesium goal.

Are Raw Materials Available?

The supply of raw materials for such a huge magnesium-production program presents no great problem. The United States is richly endowed with magnesium-bearing raw materials, for not only does an inexhaustible supply of sea water abound along its coasts, but there are also large reserves of magnesite, dolomite, brucite (though limited to one large deposit), and magnesium compounds (in various brines, bitterns, and salts). In addition, magnesium is contained in serpentine, olivine, and other silicate minerals from which the metal could be obtained if suitable and economical processes are discovered for separating the magnesium from the silica.

Sources Employed at This Time Are Brines and Seawater Only

The Dow Chemical Co., at present the sole domestic producer of magnesium, obtains the metal from $MgCl_2$ derived from underground brine at Midland, Mich., and from sea water at Freeport, Tex. The chemical engineering division of the Todd-California Shipbuilding Corporation at Permanente, Calif., plans to utilize mag-

PRINCIPAL MAGNESIUM RAW MATERIALS FOUND IN THE UNITED STATES

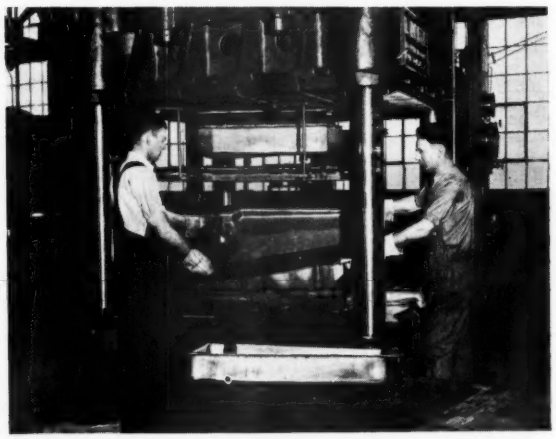
Raw Material	Composition	MgO or $MgCl_2$[1] Percent	Magnesium (Mg)[1] Percent
Brucite	$Mg(OH)_2$	60.0 percent MgO	41.6
Magnesite	$MgCO_3$	47.6 percent MgO	28.7
Dolomite	$MgCO_3$. $CaCO_3$	21.7 percent MgO	13.1
Underground brine	NaCl, $CaCl_2$, $MgCl_2$, and NaBr	3.2 percent $MgCl_2$	0.8
Potash salt byproducts[2]	K_2SO_4, $MgSO_4$ and KCl	17 percent $MgCl_2$	4.3
Other salt, brine, and bittern byproducts	(Mixed salts)	[3] (Varies)	(Varies)
Closed lake basins	do	[3] do	[4] 0.6—3.2
Sea water	do	0.47-0.55 percent $MgCl_2$	0.12—0.14
Olivine (forsterite)	2 MgO.SiO_2	57.1 percent MgO	34.5
Serpentine	3 MgO.2 SiO_2.$2H_2O$	43.0 percent MgO	25.9

[1] Analyses based upon the pure or highest-grade material.
[2] New Mexico langbeinite and sylvite.
[3] Magnesium occurs in the form of sulfate or chloride.
[4] Great Salt Lake.

The principal known domestic occurrences of magnesium-bearing raw material are as follows:

Raw Material	State	County or Area
Brucite:	Nevada	Nye
Magnesite:	California	Alameda, Kern, Monterey, Napa, San Benito, San Bernardino, Santa Clara, Stanislaus, Tulare
	Nevada	Clark, Nye
	New Mexico	Dona Ana, Grant
	Texas	Llano
	Vermont	Washington
	Washington	Stevens
High-grade dolomite:	Alabama	Jefferson
	California	Tuolumne
	Connecticut	Litchfield
	Georgia	Bartow
	Illinois	Cook, Du Page, Kankakee
	Indiana	Huntington
	Maryland	Baltimore, Frederick
	Massachusetts	Berkshire
	Michigan	Emmet, Mackinac
	Ohio	Adams, Hardin, Ottawa, Sandusky, Seneca, Wood, Wyandot
	Pennsylvania	Chester, Montgomery
	Texas	Burnet
	Virginia	Augusta, Botetourt
	West Virginia	Jefferson
	Wisconsin	Calumet, Dodge, Fond-du-Lac, Manitowoc, Ozaukee, Sheboygan
	Other States	
Brine, bittern, and salt byproducts:	California	Alameda, San Diego, San Mateo, Santa Clara
	Kansas	Reno
	Michigan	Bay, Manistee, Midland, Saginaw
	New Mexico	Eddy
	Ohio	Meigs
	Texas	Lynn, Terry, Ward
	Utah	Great Salt Lake and Desert
	Washington	Okanogan
	West Virginia	Kanawha, Mason
	Atlantic Ocean	
	Gulf of Mexico	
	Pacific Ocean	
Olivine	Georgia	Rabun, Towns, Troup
	North Carolina	Buncombe, Clay, Jackson, Macon, Madison, Mitchell, Transylvania, Yancey
	Washington	Skagit, Whatcom
	Other States	
Serpentine:	California	San Bernardino, Santa Catalina Island, parts of Coast and Sierra Nevada Mountain Ranges
	Georgia	Cherokee, Columbia, Murray
	Maryland	Harford, Washington, and others
	Massachusetts	Hampden, and others
	North Carolina	Ashe, Caldwell, Wake, Watauga, Wilkes, and others
	Pennsylvania	Bucks, Chester, Northampton, and others
	Vermont	Washington, Windsor
	Washington	Pend Oreille, Snohomish, Spokane, Stevens
	Other States	

nesium oxide derived from Nevada brucite and magnesite and from sea water salt bittern treated by the Westvaco Chlorine Products Corporation. A recent magazine article states that the Mathieson Alkali Works (Inc.) proposes to add a production unit for metallic magnesium to its ammonia-soda plant at Lake Charles, La., which probably will utilize Texas dolomite as raw material. The report adds that facilities will cost $16,000,000 and will include an electrochemical plant, reaction plant, chlorine works, lime works, and steam-electric power plant. The International Agricultural Corporation and the Union Potash & Chemical Co. are studying the possibility of utilizing the large quantities of concentrated magnesium chloride solution available at their New Mexico potash operations. The solution contains 16 to 18 percent magnesium chloride. Basic Refractories, Inc., controls large reserves of magnesite and brucite in Nye County, Nev., and it is rumored that the company intends to recover magnesium therefrom.



Hot drawing an oil tank part from magnesium alloy sheet. Dow Chemical Co.

Western Deposits Are a Probable Large Future Source of Supply

Brucite, the raw material richest in magnesium, is not at present used anywhere in the world for production of the light metal, evidently because large commercial deposits of brucite are rare. Brucite reserves in the Paradise Range, Nye County, Nev., 33 miles by road northeast of Luning, are estimated by the Geological Survey at 3,348,000 short tons. The better grade of ore contains 61 to 65 percent MgO, 1 to 4 percent CaO, 0.7 to 4 percent SiO_2, 1 percent Al_2O_3, and 0.7 percent Fe_2O_3. The brucite is mostly covered by a blanket of hydromagnesite, and reserves of magnesite occurring in conjunction with the brucite total possibly 71,000,000 tons. This magnesite contains 40 to 47 percent MgO.

In addition to the occurrences in Nye County, magnesite occurs in Navada near the Muddy River in Clark County about 5 miles south-southwest of Overton. Magnesite estimated in the Overton area totals 35,730,000 tons, averaging 30 to 38 percent MgO. Another deposit in Clark County near St. Thomas contains about 500,000 tons of ore. The magnesite in the Overton district occurs as sedimentary deposits, whereas that in the Paradise Range occurs as crystalline masses formed by replacement of dolomite or calcite beds by magnesium solutions. The magnesite deposits near Chewelah, Stevens County, Wash., also are of the latter form. In 1920 the Geological Survey estimated the magnesite reserves of Stevens County at 3,000,000 tons of commercial refractory ore and several million tons of low grade ore. Other data indicate that the low-grade ore carries 34 to 40 percent MgO, and the high-grade ore 43 to 45 percent MgO. Little data are available on the tonnage of magnesite in California, which occurs as fine-grained veins and masses associated with serpentine in the Coast Ranges and parts of the Sierras and as bedded deposits in San Bernardino and

Magnesite claims of Basic Refractories, Inc., Paradise Range, Nye County, Nevada

Kern Counties. Occurrences are reported in numerous California counties, and, although only some of these are important, reserves in the State probably will total several millions of tons and include considerable high-grade ore. Magnesite is employed in the production of metallic magnesium in Germany, France, Switzerland, and Japan and doubtless will be so used soon in the United States.

Dolomite, the double carbonate of magnesium and calcium, and high-magnesia limestone occur in large deposits scattered all over the United States. Only the larger, high-grade occurrences of dolomite are listed in the foregoing table. Cessation of imports of European magnesite forced the United Kingdom to begin using dolomite in the production of its magnesium metal. Italy and possibly France also employ dolomite.

Reserves in Brines, etc., Also Are Large

As previously stated, all present domestic magnesium production is based upon briny raw material. In addition to the unlimited supply of sea water in the United States, reserves of magnesium in brine, bittern, and salt are quite large. Langbeinite ($K_2SO_4.2MgSO^4$) and sylvite (KCl) solutions are base-exchanged to produce sulfate of potash and magnesium chloride at one New Mexico operation. A substantial quantity of metallic magnesium could be recovered from the excess magnesium chloride produced here. Waste magnesium salts probably are available from various salt and saline operations in Michigan, California, Utah, Ohio, Kansas, West Virginia, and other States. Other potential ore bodies are the closed lake basins, such as Great Salt Lake, whose waters vary considerably depending upon the location and may contain from 0.6 to 3.2 percent magnesium. The major part of the world production of magnesium probably is derived in connection with potash, salt, and saline operations. Potash waste liquors are employed in Germany and possibly France; sea water in the United States, Japan, the United Kingdom, and possibly Italy; underground brine in the United States; and lake brine in the U. S. S. R.

Olivine and serpentine contain a substantial percentage of magnesium locked up as a silicate. It remains to be seen whether economical processes will be found for the extraction of the magnesium from these and from other magnesium silicate materials. There are enormous quantities of these raw materials in the United States, and again only the outstanding known occurrences are listed in this paper.

Use of any particular magnesium-bearing raw material hinges upon economic and industrial factors peculiar to each individual process. Some of the auxiliary materials that are important in various processes include: cheap power, natural gas or oil, lime, hydrochloric acid or chlorine, and salt deposits and such reduction agents as carbon, calcium carbide, ferrosilicon, or aluminum. Factors likewise to be considered include the location of the magnesium raw material relative to the market, the proximity of water and rail transportation, and other industrial facilities.

Processes for Production of Magnesium

Two basic processes are now employed in the production of magnesium—the electrolytic chloride and the direct electrothermic oxide reduction—both of which involve the use of intricate and costly equipment and call upon the skill of highly trained technical personnel. The Dow Chemical Co. utilizes the electrolytic chloride process. At Midland, Mich., the bromine and the sodium and calcium salts of brine pumped from underground wells are first removed by evaporation, filtration, and fractional crystallization. The purified magnesium chloride solution is concentrated further by crystallization, and the $MgCl_2.6H_2O$ (hexahydrate) thus formed is partly dried. The drying operation is difficult and information on drying of the hexahydrate and introduction of the almost anhydrous magnesium chloride into the electrolytic cell is closely guarded. At Freeport, Tex., sea water is treated with milk of lime to precipitate magnesium hydroxide. The latter is chlorinated, made almost anhydrous, and electrolyzed by the same method employed at Midland. In Europe, some magnesium oxide recovered from magnesite, dolomite, or sea water is chlorinated in the presence of carbon to produce an absolutely anhydrous magnesium chloride, which is then treated electrolytically in a fused salt bath.

Although the direct electrothermic oxide reduction method has received the most attention during the last few years, the chloride process continues to contribute most of the world metal output. The electrothermic process also involves many problems, the outstanding one being that it is based upon a chemical reaction easily reversible, and a reducing or inert environment must be maintained throughout to prevent reoxidation. Carefully controlled temperatures and vacuums are essential to produce results and to prevent violent explosions. There was a disastrous explosion in August, 1939, at the pilot plant at Radenthein, Austria, where Hansgirg invented his electrothermic reduction process. It is rumored that the new British plant, employing a similar process, has suffered from a hydrogen explosion. Briefly, the Hansgirg process involves reduction of magnesium oxide with carbon in an electric arc furnace at a temperature above 1,900°C. and sudden chilling of the metallic vapor formed to 200°C. in a hydrogen or other inactive atmosphere. The condensate contains carbon, magnesium oxide, and other impurities which must be removed in a second distillation furnace. The Hansgirg process is to be employed by the Todd-California Shipbuilding Corporation, but the plant now under construction at Permanente, Calif., will use natural gas instead of hydrogen to shock-cool the magnesium vapor. Patents have been issued on numerous modified electrothermic processes which have been worked out in the laboratory or in small-scale pilot plants.

The Bureau of Mines completed construction on its laboratory-size magnesium pilot plant at Pullman, Wash., late in the spring of 1941 and early in July, 1941, made its first un-

The largest magnesium sand casting produced in quantities in the U. S. A magnesium alloy pump base weighing 1,000 lbs. Dow Chemical Co.

interrupted test run. Magnesium oxide is treated in this plant by the relatively new electrothermic process and the experiments conducted are based on the use of a spray of oil instead of the more highly explosive hydrogen in shock-cooling the metallic vapor produced in the process. The Bureau has completed studies that make it possible to beneficiate low-grade magnesite ore by flotation. The flotation concentrate can be utilized in the production of metallic magnesium or high-grade refractories.

Checking a magnesium alloy aircraft wheel casting, of the type now being supplied for commercial and military planes. Dow Chemical Co.

Process Technique Closely Held

Magnesium production and fabrication patents have received wide publicity in recent months. Early in 1941 the Department of Justice charged four American and two German firms with retarding and stifling domestic magnesium production by pooling patents, maintaining high prices, limiting consumers to one domestic source of supply, and making unlawful agreements pertaining to foreign sales and output in the United States. The American Magnesium Corporation, subsidiary of the Aluminum Co. of America and largest domestic fabricator of magnesium products, denied the charges and stated that its magnesium patent-holding affiliate, the Magnesium Development Corporation, has made its patent licenses (largely fabrication) available to any responsible and competent concern. The Dow Chemical Co. reported that its production process for the electrolysis of magnesium chloride in a fused salt bath has been developed by its own efforts, without dependence on foreign patents. The company stated that licensing rights have been procured on some fabricating methods, but these have been made available to industry without royalty. No one will deny that to be successful in the magnesium business, the "know how" is extremely important. The production of magnesium is difficult, and even after the metal is made and ready for fabrication, it is necessary to learn a manufacturing technique different in many respects from that of other metals.

Electric Energy Requirements Are Large

The unit electric energy requirements for aluminum and magnesium are the highest of the large-tonnage products in the electrochemical and electrometallurgical industry. Authoritative data are lacking on the exact power requirements for producing one short ton of magnesium, but consumption figures ranging from 20,000 to 30,000 kilowatt-hours have been mentioned for the electrolytic chloride process and 19,000 to 22,000 kilowatt-hours have been reported for the electrothermic oxide process. Approximately 500,000 kilowatts of additional installed power probably will be needed to increase the magnesium output from the present productive capacity to 400,000,000 pounds annually. The Government already is confronted with the problem of providing enough power (715,500 kilowatts) to permit production of an additional 600,000,000 pounds of aluminum. The capacity of northwestern and western hydroelectric and southwestern gas-oil steam power projects probably will be expanded to furnish the larger portion of this electrical energy.

Undoubtedly construction of the proposed magnesium plants will be assisted by priorities on steel and other needed materials. Nevertheless, the new program may be delayed somewhat because other industries also are receiving preferential treatment and manufacturing facilities are limited. Perhaps the procurement of large transformers, rectifiers, other electrical products, and furnace equipment will cause the most serious bottleneck.

Expansion Program Now Under Way

Although a number of domestic concerns displayed interest in the production of magnesium early in 1941, only the Dow Chemical Co. and the Todd-California Shipbuilding Corporation committed themselves to a definite expansion program. Dow has increased its capacity appreciably. The annual production of the company advanced from 6,700,122 pounds in 1939 to 12,521,726 pounds in 1940 and an output of 30,000,000 pounds is anticipated in 1941. The annual production rate has risen from approximately 13,000,000 pounds in Februray, 1940, to exceed 30,000,000 pounds in June, 1941. Early in 1942 Dow expects to be producing at an annual rate of 52,500,000 pounds and Todd-California at a rate of 24,000,000 pounds. The Office of Production Management wants at least 323,500,000 pounds added to this 76,500,000-pound capacity by the end of 1942. Both Dow and Todd-California probably will share a portion of the new expansion program, which is being planned by the Office of Production Management, the War Department, and the Defense Plant Corporation. In fact, the Todd-California Shipbuilding Corporation has requested the Bonneville Power Administration to reserve Bonneville-Grand Coulee power for the company for the production of 24,000,000 pounds of magnesium in the Pacific Northwest if its new California operations are successful. Basic Refractories, Inc., Mathieson Alkali Works (Inc.), International Agricultural Corporation, and other concerns may also participate in the huge Government-sponsored magnesium expansion program.

The Kalunite Company to Build Aluminum Plants

The Kalunite Company, Salt Lake City, is awaiting approval by the OPM of a plan for the construction of mine and mill facilities at Marysvale, Utah, for the reduction and concentration of alunite ore. The Marysvale location for the plant is only tentative; it may be placed at Salt Lake City or elsewhere in the West.

The aluminum oxide produced from alunite in this plant, it is planned will be refined at some other point in the West where sufficient power is available. The ore supply may come from deposits controlled by the company near Enumclaw in Washington State.

Coal cleaning plant of the company in the Roslyn field, Washington

FIVE YEARS of COAL CLEANING EXPERIENCE

By EARL R. McMILLAN
Mining Engineer
Northwestern Improvement Co.

In the Roslyn field of Washington State, the Northwestern Improvement Company has over the past several years, as changing conditions and experimentation warranted, been improving the coal cleaning practice at its centrally-located plant. Recoveries, capacity and efficiency have been greatly improved.

\+ + +

CONFRONTED with the necessity of producing cleaner coal at its Roslyn mines, the Northwestern Improvement Company, a subsidiary of the Northern Pacific Railway Company, in 1935 built a modern coal cleaning plant near the center of the field to clean the output from all of its mines. A full description of this plant was given by the writer in a paper presented at the thirteenth annual convention of the American Mining Congress in Cincinnati, Ohio, in May, 1936, and printed in the 1936 Year Book on Coal Mine Mechanization.

New Problems Affecting Plant Operation

This plant was relatively simple, and during the first year or so of operation it proved to be quite satisfactory in performance and fully adequate in capacity to handle the tonnage required of it. However, within less than a year after installation a number of conditions that formerly were considered reasonably stable began to change and to affect the operation of the plant. Likewise certain new factors began to enter the picture and to add to the problems of cleaning and preparing the coal.

Chief among these changing conditions was a gradual increase in the amount of impurities carried in the raw coal. This was largely the result of two changes in mining practice; first, the inclusion in the run-of-mine coal of an ever increasing proportion of impurities formerly gobbed in the mine, and second, the opening up of a new and dirtier seam of coal.

The effect of these changes upon plant operation was twofold; first, it increased the burden of separating and disposing of a proportionately greater tonnage of reject; and second, because of the increased proportion of interstratified particles of coal and impurities in the raw coal, the problem of making simultaneously a clean coal product and a refuse product carrying a minimum proportion of saleable coal became increasingly difficult. In fact, it eventually became impossible, with the original equipment, to produce a clean coal product without losing an excessive amount of good coal in the plant reject.

Another changing condition was a growing demand of the trade for a greater number and range of prepared sizes. For example, whereas at the time the plant was built the commercial trade was satisfied generally with two or three prepared sizes, including lump, egg and steam (1⅝-in. to 0-in. slack), it has in the meantime changed largely to a demand for egg, nut, egg-nut, pea, nut-pea, and various sizes of steam ranging from 3-in. to 0-in. down to 3/32-in. to 0-in.

Still another factor, which was also a change in original conditions, that began to affect the performance of the plant early in its operation, was an increase in the frequency and duration of periods of high moisture content in the raw coal. This change also was the result of a change in mining practice which, for safety reasons, began to require the use of more water at the face to allay dust from the mining machines.

The effect of these changes upon the operation and performance of the cleaning plant was that it gradually reduced the effectiveness of the air-table to the extent that it became, and still is, impossible to make any separation of impurities from the coal with this unit during more than about half

the time. Another and more serious effect resulting from the higher moisture content of the raw coal was that the cleaned coal carried a correspondingly higher moisture content, causing trouble with freezing in winter months, and with sticking and hanging up in chutes and bins most of the time.

Other problems than those just enumerated began to develop after the first year or more of operation; these included excessive corrosion and erosion of metal, particularly in screens, pumps, tanks, chute linings, etc. There were also problems of recovering saleable coal from the plant slurry and of clarifying the resultant waste matter.

Solutions Worked Out Through Experimentation and Evolution of Plant and Practice

These problems, of course, did not all develop simultaneously, and neither was their solution undertaken and accomplished at one time. Rather, their solution has been through constant study, experiment and evolution of plant and practice. In every instance thorough study, including both laboratory and full scale tests, has been made in order to get the correct answer, before making any material changes or additions to the flow-sheet of the plant.

For example, in determining the actual loss of saleable coal in the reject of the original plant, and the best possible means of reducing this loss to the minimum, representative samples of this material in 5- to 10-ton lots were shipped to the mines laboratory of the University of Washington at Seattle for tests, including screening, crushing, float-and-sink and actual washing tests with different types of equipment. Results of these tests led to the installation of the following equipment and addition to the plant in 1937 one coarse refuse crusher, one refuse rewash jig, one fine refuse crusher, one Deister table, and one steel settling tank for the final refuse. With this equipment 14,000 to 15,000 tons per year of saleable coal have been saved that otherwise would have been lost in the plant reject.

Vissac Dryers Added to Installation

Another major addition made to the plant in 1937 was the installation of a Vissac dryer—the first installation in this country of this now popular dryer. As was the Vissac jig, this dryer was designed and developed by Mr. G. A. Vissac, now consulting engineer, but formerly manager of mines in the Crowsnest Pass coal field of western Alberta, Canada. Selection of this type of dryer was made only after close observation and study of the various types of coal-drying equipment available. This dryer, which is unique in principle, is similar in construction to the ordinary dewatering screen in that it consists of two sloping and balanced reciprocating units in tandem and surfaced with wedge wire screen, but hooded above and hoppered below the screen decks. Removal of moisture is effected by the passing of hot furnace gases, tempered with outside air, down through the bed of wet coal as it advances over the surface of the screen. The flow of gases through the dryer, instead of being continuous, is given a controlled intermittent, or pulsating, motion by means of a special "pulsator" device—a patented feature. The gas pulsations are further amplified by being synchronized with the bed motion. Thus during the period from the beginning of one pulsation to the beginning of the next one a cycle takes place in which pressure builds up in the bed, tending to compact it and literally to squeeze free moisture from the wet material. The pressure is then released allowing the bed to progress along the deck, partially suspended by the reciprocating motion. The gas then resumes flow through the loosened bed, coming into intimate contact with virtually all surfaces of every particle, and during which evaporation continues at a high rate until increased pressure interrupts the flow. Thus the cycle is repeated, producing alternating and overlapping stages of evaporation and pressure dewatering.

As stated above, this was the first installation in the United States of this type dryer, which at that time was manufactured only by the Riverside Iron Works at Calgary, Alberta. Since then, however, American manufacturing and distribution rights have been acquired by the McNally Pittsburg Corp., of Pittsburg, Kans.

Another Jig Added

Included also in the 1937 program of plant expansion was the addition of another Vissac jig, making the third unit of this type to be installed. The main purpose in adding this unit was to increase the plant capacity, the rate of feed being increased thereby from about 175 tons per hour to 210 or more tons per hour. As auxiliary equipment to this jig, a Tyler 400-type screen was also installed at the same time to separate the minus ¼-in. material from the jig feed.

Two 60-ton loading bins and blending conveyor were also added to the plant in the summer of 1937. The purpose of these bins was to enable the plant to make and load separately three different sizes at a time, when desired, instead of only two under the original arrangement. In fact they served the same purpose as an additional loading track, but with greater flexibility, and at much less cost to build.

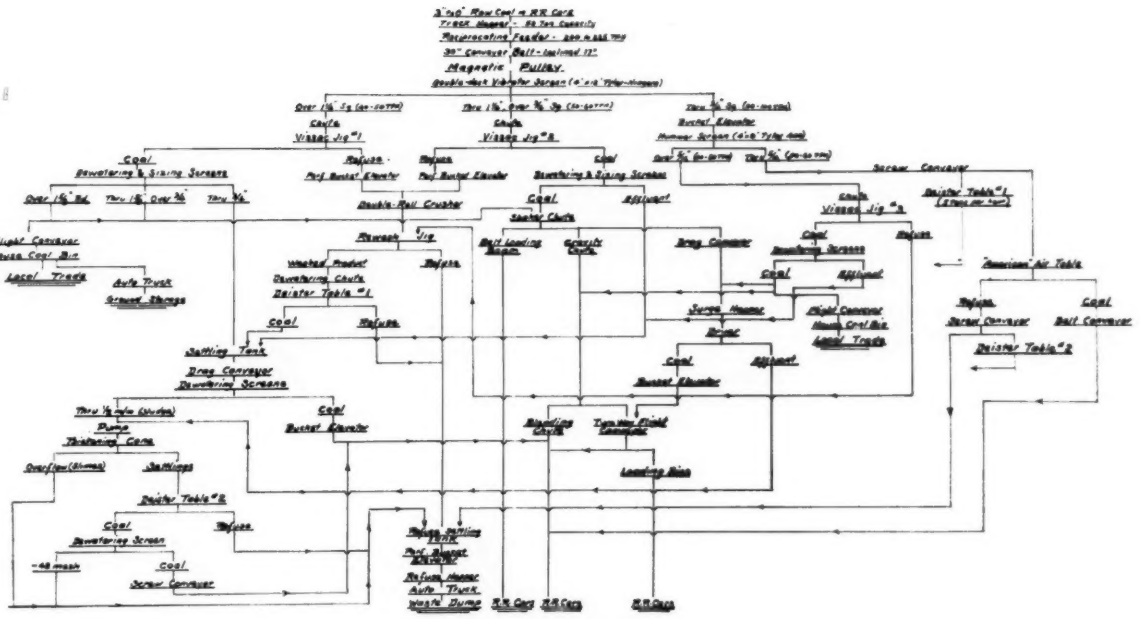
Another Table and Dewatering Screen Shows Savings of 20-25 Tons per Day

No further additions to the plant were made until 1940, when another Deister table and a Tyler-Niagara fine coal dewatering screen were installed to recover as much as possible of the good coal carried in the plant slurry and pumped as waste to a settling pond. This product was practically all minus ¾ millimeter in size and consisted of the degradation from the sludge dewatering screens and from the dryer decks. Tests at the University of Washington and U. S. Bureau of Mines had shown that approximately two-thirds of the solids in this slurry could be recovered as clean coal by tabling. Results from the plant installation have fully substantiated the laboratory results, and in consequence have shown a saving of 20 to 25 tons per day of this material.

Flow Sheet Has Been Expanded Greatly

Obviously, the above described additions have expanded greatly the flow-sheet of the plant over what it was in 1935. A brief description of the flow of coal through the plant as it is today, together with some notes relative to the type, size and capacity of the principle units of equipment, follows.

The raw coal feed to the plant is made up of all the 3-in. to 0-in. coal produced at each of the company's operating mines—No. 3, No. 5, and No. 9—totaling 3,500 to 4,000 tons per day. This material consists of not only the minus 3-in. screenings out of the run-of-mine, but also the crushed interstratified material (middlings) from the picking tables at the tipples,



Flow sheet of plant

plus crushed lump coal from Mines No. 3 and No. 9. This material is loaded directly at the tipples into open railroad cars and then switched, usually at the end of the tipple day shift, to the raw coal yard of the cleaning plant. This yard has three parallel tracks—one for a full day's run from each mine. These tracks converge into a single track leading over a track hopper, then diverge into two parallel loading tracks running under the plant and beyond, to the cleaned coal yard.

The raw coal loads are dropped by gravity (1.4 percent grade) with hand brake onto the track hopper—capacity 50 tons. The coal is unloaded by dropping the bottom doors of the cars, but some shoveling and brooming is usually necessary. Two reciprocating feeders forming the bottom of the hopper, working opposite and alternately, feed the coal onto a short inclined belt conveyor, 30-in. wide, running out of the hopper pit at right angles to the track, and load the coal in a uniform stream onto the main inclined (17°) conveyor belt running at 300 feet per minute, to the top of the main building. At this point the coal is discharged over a magnetic pulley and onto a double-deck vibrator screen (4 ft. by 12 ft. Tyler-Niagara Type 300) surfaced with 1¼-in. square hole wire cloth on the top deck and ¾-in. square hole wire cloth on the bottom deck. The plus 1¼-in. product runs directly via chute to Vissac jig No. 1, the minus 1¼-in. plus ¾-in. product likewise runs via chute to Vissac jig No. 2, and the minus ¾-in. product goes via bucket elevator to Tyler "400" hummer screen, surfaced with 5/16-in. Tyrod screen cloth. The oversize (¾-in. to 5/16-in.) runs directly via chute to Vissac jig No. 3, and the minus 5/16-in. product flows via screw conveyor to air-table (American Coal Cleaning Corp. pneumatic separator, Type Y—size RB 8 ft. by 17 ft., 6 in.).

The washed coal from Vissac jig No. 1, with wash water, passes via flume to tandem dewatering screens, then on shaker conveyor and belt loading boom to railroad car, or as an alternative course, by means of gravity chutes it may be added to either of the smaller sizes as desired, or as still another alternative, may be delivered by elevating conveyor to truck bunkers located adjacent to plant, for local trade.

The washed coal from Vissac jig No. 2, with wash water, passes via flume to separate tandem dewatering screens, then on shaker conveyor and belt loading boom to railroad car; or by way of gravity chute to a common loading point for blending with any of the other sizes; or by gravity chute and conveyor to surge hopper at head of dryer; or on conveyor to loading bins.

The washed coal from Vissac jig No. 3, with wash water, flows via flume to a third unit of tandem dewatering screens, then on shaker conveyor and flight conveyor to loading bins; or by way of gravity and drag conveyor to surge hopper at head of dryer; or by elevating conveyor to truck bunkers, for local trade.

The cleaned 5/16-in. to 0-in. coal from the air-table is carried on a conveyor belt to the common loading point, where normally it is added to one or more of other sizes to make commercial steam or railroad coal. However, it can be, and occasionally is loaded separately.

The refuse from Vissac jigs No. 1 and No. 2 goes by means of perforated bucket elevator to a double-roll crusher, set to crush to 1½-in. maximum, then via flume to the rewash jig—a specially designed and locally built piston type jig. The refuse from Vissac jig No. 3 is added to the crushed refuse from jigs No. 1 and No. 2 flowing to the rewash jig.

The washed product from the rewash jig, with wash water, passes via flume with ½-millimeter wedge wire bottom to a second double-roll crusher, set to crush to ⅜-in. maximum, and then to Deister table No. 1.

The washed product from this table, with wash water, is flumed to a sludge tank, which also receives the degradation from the primary washed coal dewatering screens. The coal is removed from this tank by drag conveyor and discharged onto tandem dewatering screens surfaced with

½-millimeter wedge wire and with fresh water sprays on first section. From this screen the rinsed and partially dewatered coal goes by bucket elevator to the surge hopper at head of the dryer.

The coal going to the dryer, therefore, as already indicated, is composed of two or more products. Normally it consists of the washed ¾-in. to 5/16-in. (pea) size, which runs about 40 tons per hour, and the plus ½-millimeter sludge, which varies between 8 and 10 tons per hour. At times, however, when the pea coal is being loaded separately the nut coal (1⅝-in. to ¾-in.) is substituted in the dryer feed.

The surface moisture content of the coal as it enters the dryer normally runs between 12 percent and 15 percent, and, in the 40 seconds required for the coal to pass through the dryer, is reduced to 2 percent to 3 percent.

The dried coal is then elevated and discharged onto the two-way flight conveyor, which delivers it either to the loading bins or to the common loading chute, depending upon the blend of sizes desired. Normally, however, it is returned to the common loading point and there blended with the 5/16-in. to 0-in. air-cleaned coal to make ¾-in. steam. To make 1⅝-in. steam, the mechanically dewatered nut (1⅝-in. to ¾-in.) size is added to this blend, and to make 3-in. steam, the egg (3-in. to 1⅝-in.) size is also included.

Minus One-half Millimeter Material, Formerly Wasted, Now Fed to Table

Until recently, as discussed earlier in this paper, all of the minus ½-millimeter material derived from the sludge rinsing and dewatering screens, together with the dryer effluent (coal and water passing through the ¾-millimeter wedge wire decks of the dryer) was pumped out as waste to the slurry pond. Now, however, this material, amounting to about 1½ tons per hour, is pumped to a 6-ft. settling cone which serves to deslime and to increase the pulp density of the material sufficiently to make it suitable for feeding onto the table.

The thickened material is then fed from the bottom of the cone, through a motor-driven rotary valve, directly to the feed box of Deister table No. 2. In order, however, to keep this table running continuously and with the minimum load for good operation, between 4 and 5 tons per hour of raw 5/16-in. to 0-in. coal is added to the thickened sludge in the feed box of the table. The resultant washed product is flumed directly to a 4-ft. by 8-ft. Tyler-Niagara dewatering screen, sloping uphill at 2 degrees, and surfaced with a 48-mesh equivalent stainless steel wire cloth on a rubber-covered backing cloth. The dewatered coal, which still carries 20 percent or more surface moisture, is then conveyed via screw conveyor to the discharge end of the Vissac dryer, where it is fed into the flow of dried coal as the latter is picked up by bucket elevator.

The minus 48-mesh material from the above dewatering screen goes into the main refuse settling tank, and is pumped from there along with other slurry to a series of settling ponds.

Final Refuse Products

The final refuse product from the plant is made up of the following products, viz: (1) Reject from the rewash jig, (2) reject from air-table, and (3) rejects from both Deister tables. It is removed from the plant by a perforated bucket elevator that discharges into a 50-ton bin, from which it is hauled by auto truck to a dumping ground some 1,000 to 1,500 ft. from the plant. Much of it has also been used for ballasting new roads throughout the field. The quantity of this material runs from 350 to 450 tons per day and averages between 11 percent to 12 percent of the raw coal feed to the plant. Its ash content runs between 60 percent and 65 percent.

Stainless Steel Parts Eliminate Corrosive and Erosive Effect of Wash Water and Wet Coal

In addition to the problems already enumerated, one other has been given continuous study; that is, the highly corrosive and erosive effect of the wash water and the wet coal upon all metal surfaces with which they come in contact. This has been a serious economic problem because of the all too frequent renewals and repairs to equipment that have been required. However, through experiment largely, ways and means have been found to overcome this difficulty to a great extent, with a consequent reduction in these maintenance charges.

The degree of success achieved thus far has come through substitution of certain stainless steels for other metals wherever possible, and through the use of rubber or other protective coatings on regular metal surfaces. For example, stainless steel, type No. 304, has been found to be the only satisfactory metal in such uses as wedge wire dewatering screens and dryer decks, jig bed screens, dryer fan blades, pump impellers, chute linings, and fine mesh wire cloth. Other metals, including special carbon steels, hard brass and phosphor-bronze, have been thoroughly tried.

As an illustration of the superior lasting qualities of type No. 304 stainless steel over ordinary carbon steel in dryer fan service, the maximum life of fan blades made of either ordinary carbon or special carbon steel was about 90 days, whereas after attaching

(*Continued on page 39*)

General view of plant

Typical scene in the vanadium-uranium ore district of Colorado

Geological Studies of Vanadium-Uranium Deposits by Geophysical Exploration Methods

By SHERWIN F. KELLY

President
Sherwin F. Kelly Geophysical Services, Inc., and President
Geophysical Explorations Limited

As the techniques of geophysical exploration continue to be developed additional fields of application are found. This article describes the successful application of resistivity methods, supplemented by radioactive measurements, to the delineation of certain structural features with which vanadium-uranium ores are associated in an area in southwestern Colorado.

\+ + +

IN PROSPECTING, just as in military science, a flank attack may yield better results than a frontal manoeuver. This is becoming increasingly evident with the widening application of geophysics to mining exploration problems, and the trend is furthermore accentuated in this period of emergency.[1]

Geology and Topography of the Area

Geophysical tests recently were made on vanadium-uranium occurrences in southwestern Colorado, near the confluence of the Dolores and San Miguel rivers. It is in a high plateau region where deeply incised rivers have cut steep-walled canyons in the colorful shales and sandstones of Permian, Triassic, Jurassic and Cretaceous ages. These beds are largely of continental origin, and vary from massive to thin-bedded. The sandstones often exhibit pronounced cross-bedding, and their constituent mineral grains are usually rounded and well sorted. The rich coloring of both sandstones and shales, in shades of vermilion, maroon, pink, salmon, buff, brown, and green, not only provides the geologist with readily recognizable markers, but also introduces a strong accent of color in an otherwise austere landscape. Tectonic disturbances have thrown these strata into a series of broad, gentle anticlinal and synclinal folds, 3 to 12 miles wide and tens of miles long, their axes parallel and trending northwest-southeast, rather like swells on an ocean, spreading to the southwest from the Uncompahgre uplift. Faults of a hundred feet or so, to nearly 3,000 ft. displacement, mostly normal, complicate these structures somewhat, particularly in the anticlines. Out of these rocks, weathering and erosion have carved high, flat-topped plateaus, and precipitous-walled canyons. Thick, resistant sandstones make the cap rocks, or rim rocks, of the plateaus, forming steep-walled cappings above the less precipitous slopes predominating in the underlying shales. Massive sandstones in places constitute vertical, unscalable walls of many canyons and buttes, often several hundred feet high and extending unbroken for miles. Where thinner sandstones and shales are interbedded, the sandstones frequently form benches, which rise by steps, sometimes broad, sometimes narrow, from the bottoms of the canyons to the flat-topped summits of the mesas and plateaus. It was on one of these broad benches that the geophysical campaign was carried out.

The vanadium-uranium deposits are found in the sandstones of Jurassic age known as the McElmo or Morrison

[1] Geophysical Delineation of Structure in Mining Exploration, by Sherwin F. Kelly; Transactions, American Geophysical Union, 1939.

formation.[2] This formation is from 500 to 900 ft. thick, and in the upper part consists predominantly of maroon shales, whereas buff sandstones predominate in the lower part. In the region where the geophysical work was carried out, the commercial deposits of vanadium-uranium ores are found in a persistent bed of sandstone that marks the top of the lower half of the formation, and which forms a prominent bench throughout much of the area.

The Ore Deposits Occur in Sandstone

The ore deposits themselves are irregular, not only in outline but also in occurrence. The vanadium minerals, of uncertain identity, are found as a cementing material in the sandstone, and absorbed in clay galls and shaly seams. The vanadium minerals may show uniform dissemination in the sandstone, forming a massive ore; or the ore may be banded, with the bands either following the bedding or cutting across it; or it may be in irregular spots and bunches, lenses and seams. The massive, banded, or spotted ores, dark brown or black in color, stand out very clearly against the light brown or buff sandstone in the underground workings. Occasionally, canary yellow spots show up brilliantly against the dark background of vanadium ore. They may be flecks scattered through the black background, or spots as much as a foot or more in diameter marking the ends of carnotite "logs." This canary yellow mineral is carnotite, an ore of uranium, a potassium uranium vanadate. It is found disseminated in the porous sandstones, as coatings along fractures and joints, and massive in the form of so-called logs. These latter are supposed to represent pseudomorphs after vegetable matter, and cases are known where they attained a diameter of several feet and lengths up to 100 ft. Two such logs are on record which together yielded uranium and vanadium worth $232,900.

Manner of Deposition Uncertain

How these vanadium and uranium ores came to their present positions is a moot question. Whether or not the vanadium ore was laid down at the time the sandstone was deposited, or was subsequently introduced, is still a subject for debate, and evidence can be found underground to contradict almost any hypothesis so far presented. Only a thorough and extensive study of the mineralogy and geology of these deposits will eventually reconcile these apparent conflicts. However, the preponderance of the evidence seems to point to a syngenetic origin of the vanadium, possibly with some movement and redeposition since it was originally laid down with the sandstone. The substance of the carnotite was probably enclosed in the original deposits of sand, with its present mode of occurrence due almost entirely to subsequent solution and redeposition by meteoric circulation.

In form, these vanadium-uranium orebodies are irregular, with wide variations in size. They may be from a few feet up to several hundred feet wide, and from a few tens of feet up to several thousand feet in length, while the thicknesses vary from a few inches to 20 or 30 ft. In plan they show an irregular and branching outline, recalling the distributive channels of delta formations. In fact, in that district, they are called channels.

What Methods to Use?

The first question to be answered was whether or not the vanadium ores possessed any distinctive physical characteristics which would enable us to differentiate them directly by geophysical techniques. For example, certain ore minerals, principally the sulphides, are metallic conductors of electricity and, in contact with the ground moisture always present in the enclosing rocks, actually generate a current of electricity. Thus, they constitute natural, buried electric batteries, whose presence can be detected by observing at the surface of the ground the flow of electricity which they produce.[3] Unfortunately, the vanadium and uranium minerals found in the deposits under discussion, are not metallic conductors of electricity and hence exhibit no spontaneous electrical activity. This precluded using one of the simplest and most efficient geophysical techniques. Another relatively simple technique, the magnetic one, was ruled out by the lack of pronounced magnetic effect on the part of the ore minerals. Tests showed that the electrical resistivity of the orebodies was not pronouncedly different from that of the enclosing, barren sandstone. This prevented the utilization of ground resistivity measurements for the purpose of outlining zones of either higher or lower resistivity, which would serve to differentiate the orebodies from their surroundings.[4] The elimination of these simple frontal attacks on the prospecting problem left a flank attack as the only possible answer, in which the objective would be to discover whether or not there were structural features controlling the loci of ore deposition, and which could be detected geophysically.[1, 5] If such structural features, associated with ore occurrences, could be outlined geophysically, subsequent drilling could then be directed with greater efficiency, so as to concentrate on the favorable areas, and to eliminate the useless work of drilling barren zones. Elimination of the useless work would conserve time, effort and money; furthermore, orebodies which would otherwise remain forever concealed, might thus be readily discovered.

An area approximately half a mile wide and two miles long was selected for geophysical investigation. This region forms a broad bench, underlain by the ore-bearing sandstone, which dips gently to the northeast, about 10 or 12 ft. in a hundred feet. The ore-bearing formation outcrops in places near the edge of the bench, but in the main is covered by alluvium and wash as much as 60 ft. deep. The general strike of the formations is northwest-southeast, but the trace of this sandstone horizon at bedrock surface varies in places, due to topographic effects.

Electrical resistivity mapping of the ore-bearing sandstone beneath its covering of wash and alluvium, seemed to

[2] Radium, Uranium and Vanadium Deposits of Southwestern Colorado, by R. C. Coffin; Bulletin No. 16, Colorado Geological Survey, 1921. Sedimentary Deposits of Copper, Vanadium-Uranium and Silver in Southwestern United States, by Richard B. Fischer; Economic Geology, Vol. 32, No. 7, November, 1937.

[3] Conrad Schlumberger, Etude sur la prospection electrique du sous-sol, Gauthier-Villars, Paris, 1920. Translated into English by Sherwin F. Kelly, under the direction of the author. An abstract of this translation, Study of Underground Electrical Prospecting, appeared in the Eng. Ming. J., v. III, Nos. 19 and 20, pp. 782-788 and 818-823, New York, May 7 and 14, 1921. Cutting Exploration Costs with Geophysics, by Sherwin F. Kelly; Canadian Mining Manual, Gardenvale, Quebec, 1938.

[4] Discovering Gold Quartz Veins Electrically, by Sherwin F. Kelly, Theodor Zuschlag, and Bela Low; Mining & Metallurgy, v. 15, No. 330, New York, 1934. The Role of Geophysics in the Exploration for Gold, Sherwin F. Kelly; Canadian Min. J., Gardenvale, Quebec, 1935. Geophysics Through Ice and Snow, by Sherwin F. Kelly; Canadian Min. J., Gardenvale, Quebec, October, 1939.

[5] The Method of the Ground Resistivity Map and Its Practical Applications, by C. and M. Schlumberger; Bulletin, Canadian Inst. Min. Metall., No. 226, Montreal, 1931. Some Applications of Potential Methods to Structural Studies, by E. G. Leonardon and Sherwin F. Kelly; Geophysical Prospecting Volume, Trans. Amer. Inst. Min. Metall. Eng., New York, 1929; same paper appeared Trans. Canadian Inst. Min. Metall., v. 31, 1928. Exploration for Ore by Potential Methods, by E. G. Leonardon and Sherwin F. Kelly; Bull. Canadian Inst. Min. Metall., No. 189, Montreal, 1928.

offer the most promise of yielding results. Sandstones show high electrical resistivities, of the order of 100 to many hundred meter-ohms, whereas shales are much better conductors and usually show resistivities of a few tens of meter-ohms, or less. A resistivity of say 100 meter-ohms, means that a cube of the material measuring one meter along each edge would have an electrical resistance of 100 ohms. This pronounced contrast between resistivities of shales and sandstones renders their differentiation quite easy by electrical measurements.

Electrical resistivity apparatus in use during the survey. Power supply (B batteries) on the ground; measuring instruments on tripod

Resistivity Survey Made in Selected Area

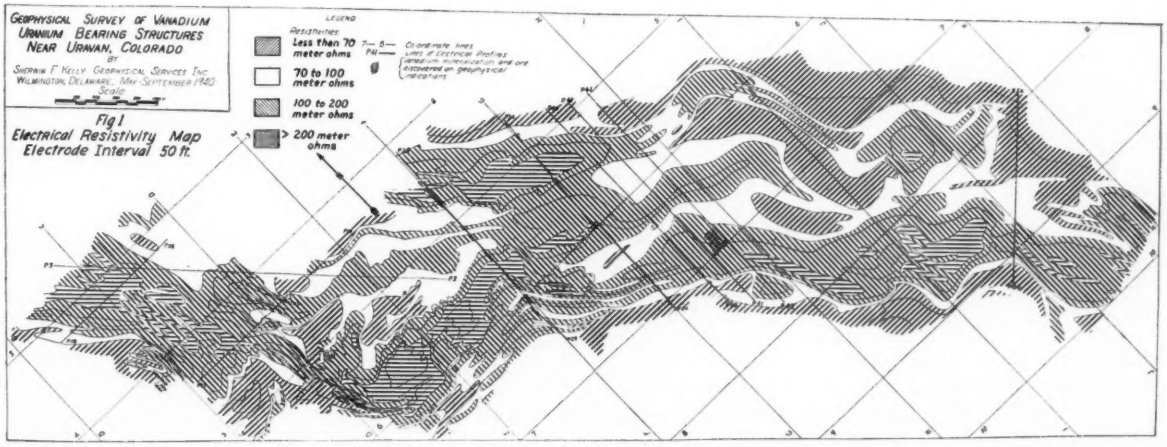
The technique of observing the electrical resistivities of rocks in place, consists of passing a measured electric current through the ground (about 100 volts), and recording the potential drop occurring at the surface within a certain interval. Electrical contact is made with the earth by driving four short metal pegs a foot or so into the soil. They are spaced at equal distances apart along a straight line, the outside ones (the power electrodes) being used to pass the current through the ground. The inside pair (reading electrodes) serve to shunt the ground current to the measuring instrument, where the potential drop occurring in the earth between them is measured. In the present survey two electrode spacings were used; for one series of measurements the spacing between the electrodes was 50 ft., in the other series of measurements it was 100 ft. This provided a depth of investigation of approximately 50 ft. in the first case, and of 100 ft. in the second. The data thus obtained were used to calculate the average resistivities of the material included between the reading electrodes at each station, down to the depth of investigation achieved. By systematically traversing the zone under investigation, the ground resistivities are observed at a sufficiently large number of points to permit construction of resistivity maps of the area. Some of the electrical profiles, or traverses, are illustrated herewith, as well as one of the resistivity maps. The two depths of investigation used enabled us to construct two resistivity maps, one for each depth, but since that of the shallower depth (50 ft.), is the more clear-cut and informative, it is the only one reproduced here.

Altogether, the electrical survey of this area involved the taking of more than 4,000 readings, distributed over 30 miles of electrical profiles or traverses. The two sets of observations made, one for 50 ft. and one for 100 ft. depth of investigation, renders this the equivalent of 60 miles of traverses. These traverses or profiles, were oriented so as to cut across the general trend of the formations being studied, their directions varying from east-west to north-south according to circumstances. The spacing between successive profiles was normally 200 ft. The dispositions of some typical ones are shown on Fig. 1.

Resistivity Maps Constructed

From this extensive series of electrical resistivity observations, the two resistivity maps were constructed, showing the distribution of zones of different, typical resistivities. Such a map for the electrode interval of 50 ft. is given in Fig. 1. In reality, this is a geological map in which the geological formations are classified and mapped on the basis of a physical character—their electrical resistivities. In general, zones of high resistivity correspond to sandstones, while shales are responsible for those of low resistivity. The ore-bearing sandstone gives rise to the bottom, or southwestern zone of high electrical resistivity, stretching from coordinate 3-C in the northwest, to coordinate 10-K in the southeast. Further discussion will therefore be confined to this zone.

Figure 1



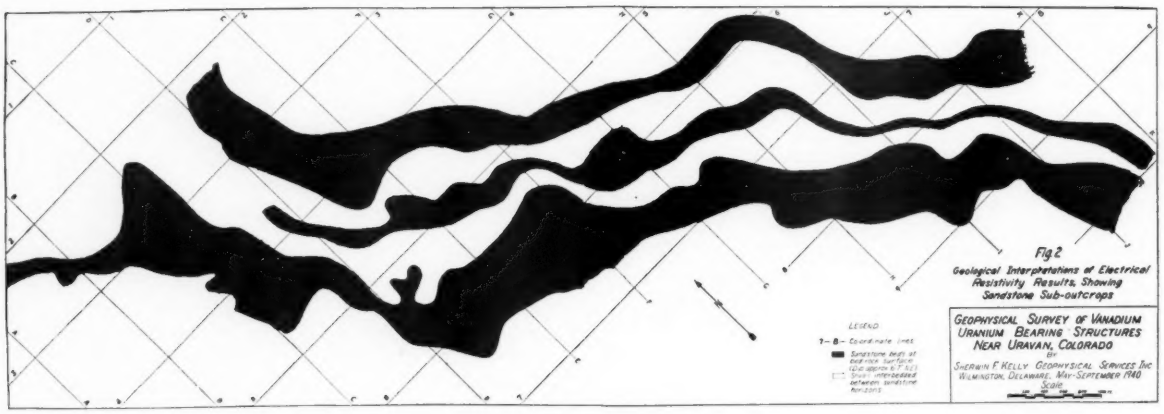


Fig 2
Geological Interpretations of Electrical Resistivity Results, Showing Sandstone Sub-outcrops
GEOPHYSICAL SURVEY OF VANADIUM URANIUM BEARING STRUCTURES NEAR URAVAN, COLORADO
BY
SHERWIN F KELLY GEOPHYSICAL SERVICES INC
WILMINGTON, DELAWARE, MAY-SEPTEMBER 1940
Scale

Figure 2

A comparison between this resistivity map and that to the greater depth of investigation (100-ft. electrode separation), demonstrates the interesting fact that the zones of distinctive electrical resistivities are all shifted somewhat to the northeast on the latter map, as compared to the one shown herewith. Thus, a dip to the northeast is indicated for the underlying formations.

On the basis of the resistivity results, a geological map was constructed depicting the bedrock traces of the sandstone and shale horizons beneath the covering overburden. This is given in Fig. 2. It represents roughly what the bedrock would look like were the overburden to be swept away. Resistivity data not shown on Fig. 1 were used to complete the northwestern end of the maps in Figs. 2 and 3.

The southwesterly zone of high ground resistivity, and the sandstone horizon deduced from its sinuous trend, both exhibit certain striking thickenings and protuberances. One such pronounced thickening occurs in the region of coordinate 3-C; another striking protuberance is observed just southeast of coordinate 5-D; again, the sandstone bed thickens along coordinate 6 from E to F; another, minor broadening of the sandstone bed lies between coordinates G and H, just north of 7; repeated apparent thickenings of the ore-bearing horizon are observed from here southeast to coordinate 9-J. Such irregularities in this resistant, sandstone bed carry important implications, and require careful evaluation.

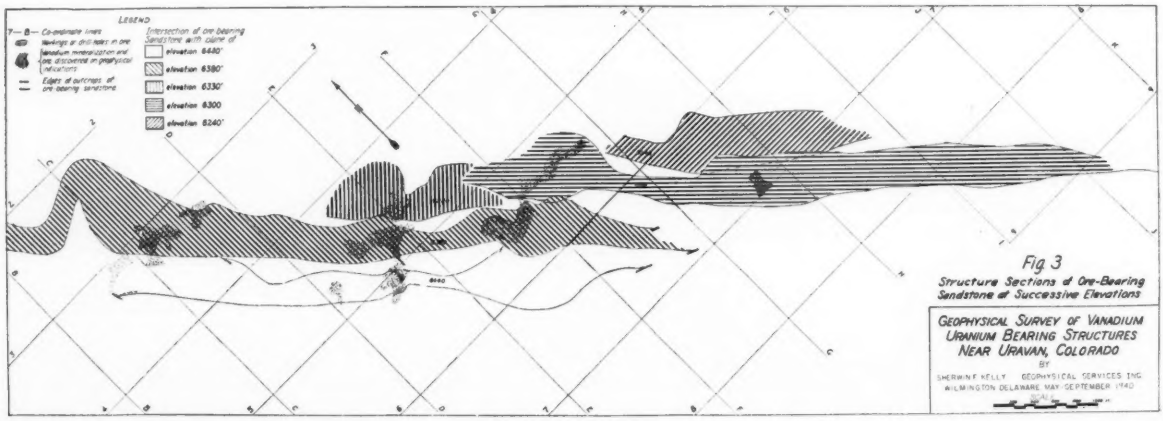
Corrections Made for Topography, Which Affects Apparent Results

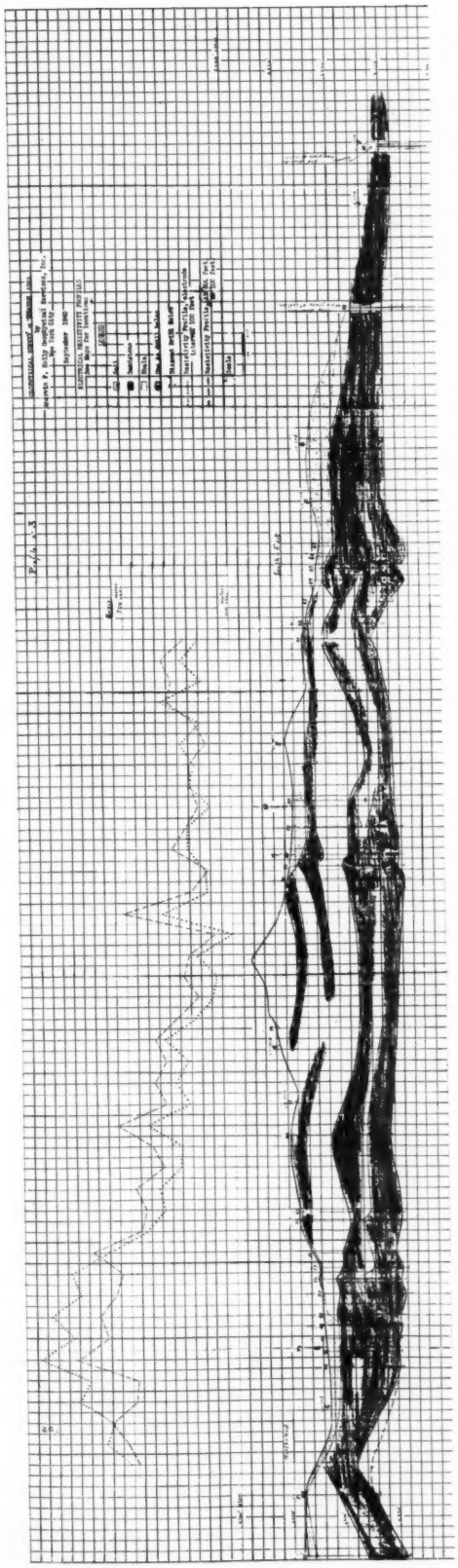
Certain thickenings were referred to above as being apparent only, for their true significance can not be evaluated until the topography has been taken into consideration. If for example, the ground slopes with the dip of the beds, and a sandstone formation lies but a short distance beneath the surface, then the electrical measurements will record high resistivities as long as the profile continues up or down the dip slope, close to this resistant horizon. Should the surface slope be opposite to the dip, the electrical profile will quickly traverse the sandstone bed, which will manifest itself then as but a narrow strip of high electrical resistivity. Only when such results are mapped against the topography, and the necessary corrections made, will the resistant and conductive horizons show their true widths. Fig. 3 gives the results of applying such correctives, so as to show horizontal sections through the vanadium-bearing sandstone at certain successive depths. The sinuosities and irregularities of that horizon toward the southeast end of the area surveyed have now disappeared, demonstrating that they were only the effect of topographical irregularities.

Known Bodies of Ore in Certain Parts of Area

On this map there are stippled patterns, outlining bodies of vanadium-uranium ore in process of exploitation, or known from underground exploration, or by drilling from the surface.

Figure 3





Just south of coordinate 3, there lie three orebodies between coordinates B and D, where the sandstone thickens very markedly. The queer, protuberant zone of high resistivity just southeast of coordinate 5-D, is evidently the electrical symptom of a sandstone horizon which thickens progressively with depth. Within this thickening lies a body of ore rich in vanadium and uranium. Most pronounced of all the broadenings of this productive bed, is that found in the region of coordinate 6-F, wherein there lies a body of good ore, outlined by drilling while the electrical survey was still in progress. That such thickenings of the ore-carrying beds constitute favorable indications had previously been postulated in this district, from examinations of ore-bearing outcrops in canyon walls. However, no underground study of the phenomenon, such as here presented, had been made in the area geophysically investigated.

As the geophysical work continued to the southeast, a new, but minor widening of the sandstone horizon became evident just northeast of coordinate 7-G. No drilling had been done in this immediate vicinity, although the area farther to the southeast had been well explored by the drills, with negative results. This new, electrically indicated zone of thickened sandstone therefore lay within a small unexplored area, and seemed a favorable spot for the occurrence of vanadium-uranium mineralization. It was not expected to contain a striking orebody, however, for two reasons. In the first place, the widening of the sandstone horizon is not as pronounced here as it is in the neighborhood of the ore deposits already mentioned (coordinates 3-C, 5-D, and 6-E to 6-F).

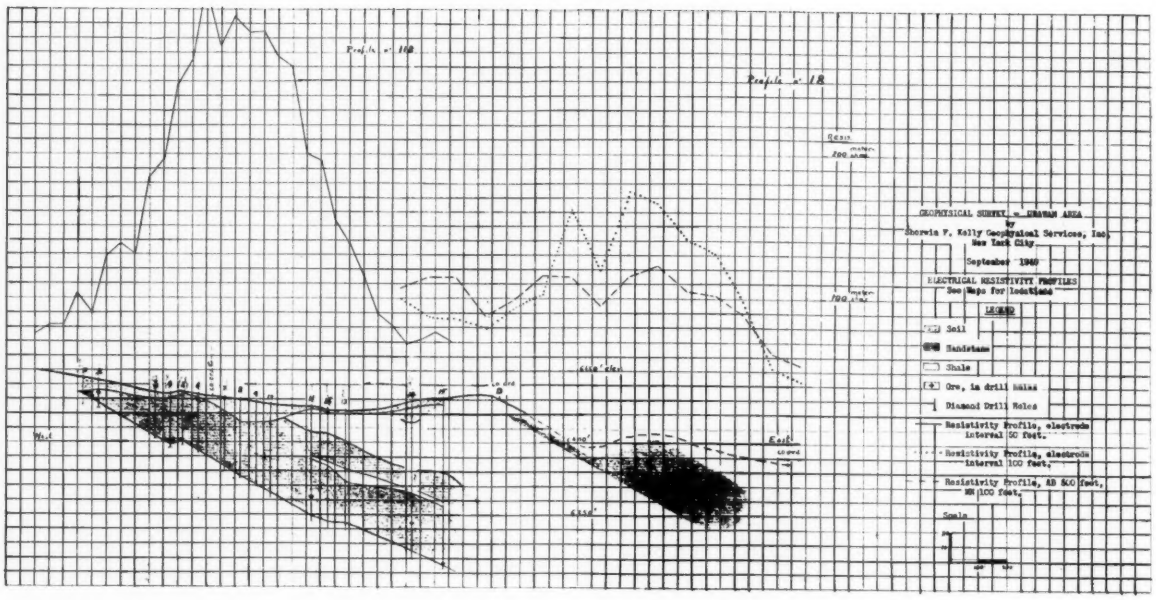
In the second place, the character of the sandstone bed itself, as deduced from the electrical measurements, is not as favorable for the occurrence of rich mineralization. Near coordinate 6-F in Fig. 1, the interfingering of zones of low resistivity in the high resistivity band, indicates an intercalation of shale layers in the sandstone. A similar situation exists near coordinate 5-D. This interbedding of shale within the sandstone has been found to constitute a favorable factor for the deposition of good ore. No such pronounced interfingering of zones of high and low resistivity is noted in the thickened zones near coordinate 3-C, and it is noteworthy that the ore here is not as good as at the two previously mentioned locations. Since the electrical resistivity results just northeast of coordinate 7-G exhibit an even more uniform pattern than near 3-C, it was concluded that the sandstone would be massive, with but little intercalated shale.

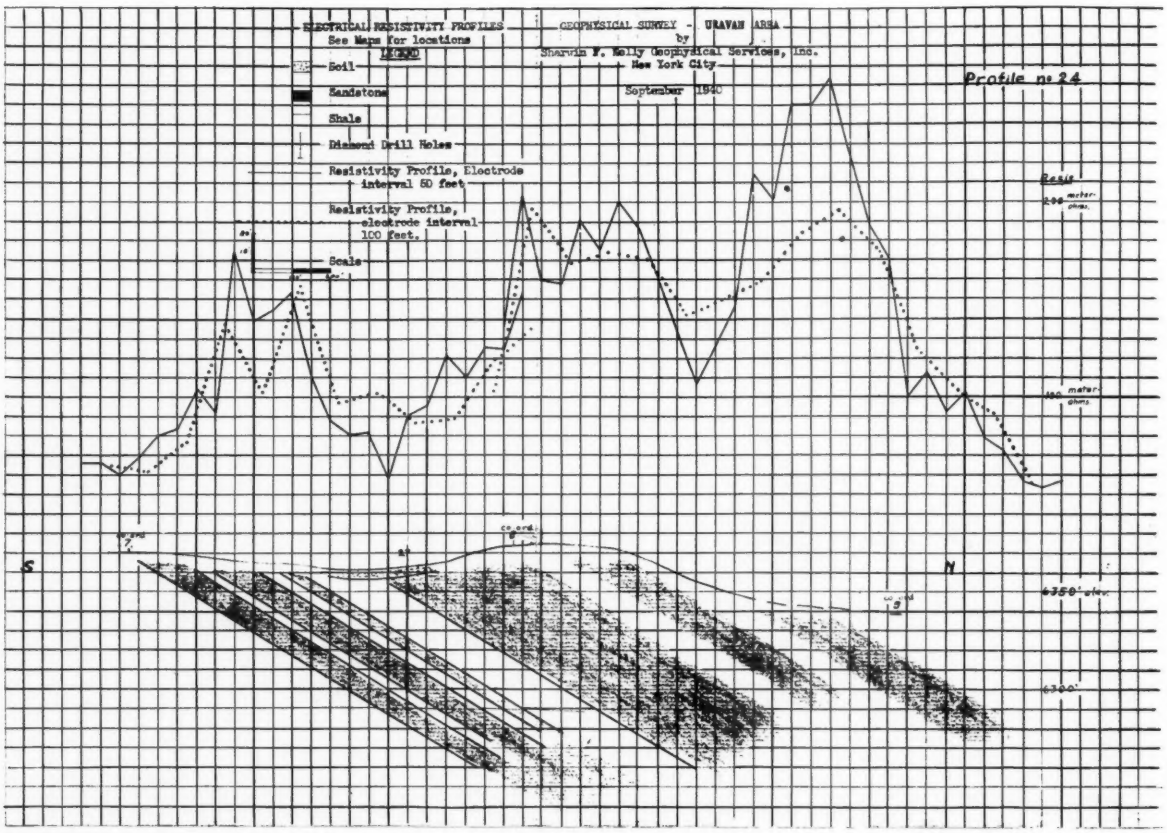
Interpretation of Results Indicate Additional Bodies of Ore

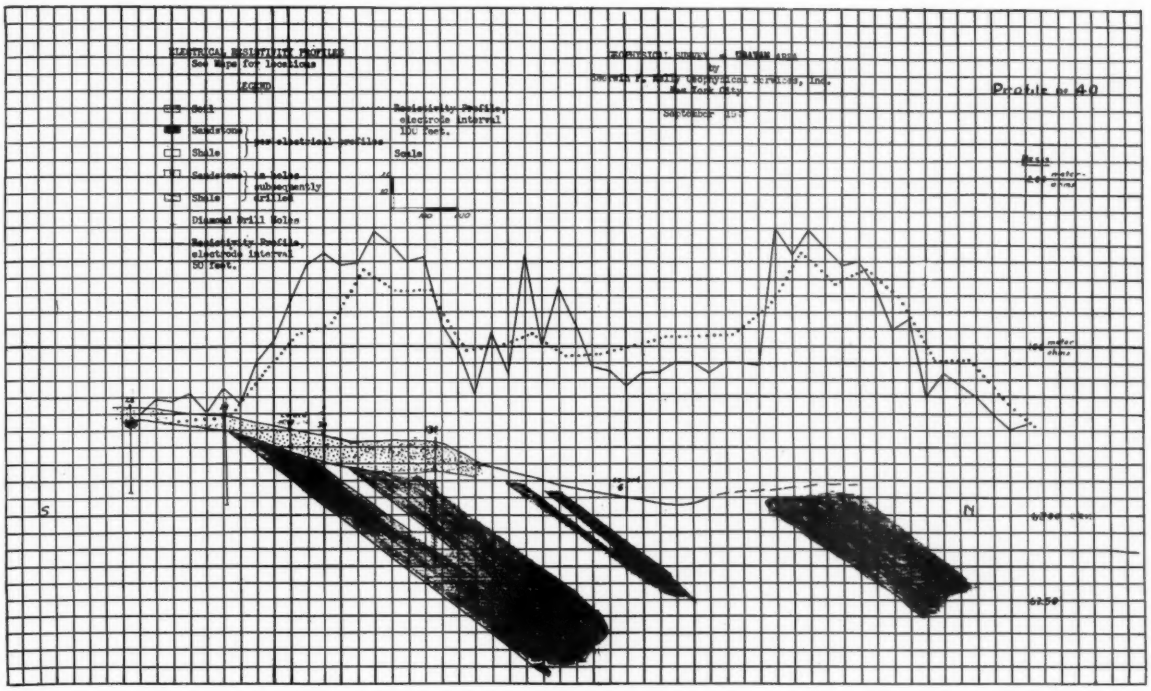
To summarize, the broadening of the sandstone northeast of coordinate 7-G was considered a favorable indication for vanadium-uranium mineralization, but the minor character of this thickening, and the indicated absence of much intercalated shale, were believed to militate against the occurrence of a large or rich orebody. However, drilling was recommended and 21 holes were put down. Eight of these encountered vanadium-uranium mineralization, with at least two showing good values and thicknesses. The drilling program did not completely test the ore possibilities, as some of the holes did not go deep enough; also, the mineralized area was not fully delimited, since it is still open on at least two sides. The geophysical predictions were nevertheless verified on both scores, that the electrically indicated area was favorable for mineralization, but not for a high grade, or large orebody.

Electrical Profiles Illustrate Results

Reference to some of the electrical profiles and their corresponding cross-sections, will probably assist the reader in visualizing the geological and electrical situations. A few such profiles and cross-sections are accordingly shown, and their locations are indicated on Fig. 1. Profile 118 traverses the thickened zone of sandstone near coordinate 3-C. It shows the high resistivity measured over a massive sandstone concealed by but a shallow overburden. The uniformly high character of the electrical peak indicates


Profile no 18
Profile no 18
GEOPHYSICAL SURVEY - URAVAN AREA
by
Sharwin F. Kelly Geophysical Services, Inc.
New York City
September 1940
ELECTRICAL RESISTIVITY PROFILES
See Maps for locations
LEGEND
Soil
Sandstone
Shale
Ore, in drill holes
Diamond Drill Holes
Resistivity Profile, electrode interval 50 feet.
Resistivity Profile, electrode interval 100 feet.
Resistivity Profile, AB 800 feet, MN 100 feet.
Scale


ELECTRICAL RESISTIVITY PROFILES
See Maps for locations
LEGEND
Soil
Sandstone
Shale
Diamond Drill Holes
Resistivity Profile, Electrode interval 50 feet
Resistivity Profile, electrode interval 100 feet.
Scale
GEOPHYSICAL SURVEY - URAVAN AREA
by
Sharwin F. Kelly Geophysical Services, Inc.
New York City
September 1940
Profile no 24
Basis
200 meter-ohms
100 meter-ohms
S
N
4350' elev.
4300'



the lack of any pronounced intercalations of shale, a fact already evident from the drilling. Ore is shown in several of the drill holes. Profile 24 traverses a thin zone in the sandstone, barren of ore, where the resistivity is lower, and there are intercalations of shale. Profiles 40, 41 and 42 show increasing resistivities over the ore-bearing horizon, and increasing thicknesses for this bed, on going southeast into the area of the new indication. Profile 40 furthermore gives a striking indication of how the resistivity results can be used to save needless expense. If this profile had been measured prior to the drilling of holes No. 28 and No. 29, it would have been unnecessary to put them down; the electrical results clearly show that they would lie in the footwall shales of the ore-bearing sandstone, and not cut the latter formation at all. A few of the drill holes put down on the geophysical recommendations are also shown in these sections, some of which encountered vanadium-uranium mineralization.

Profile 3 gives a longitudinal section through three of the ore-bearing zones, and illustrates well the manner in which the ore-bearing sandstone thickens, and exhibits irregularities where it carries ore. It was constructed largely on drill hole data, but the electrical results are given for the purposes of comparison. It is evident that profiles such as this, oriented parallel to the strike are less informative than those at right angles thereto.

As a matter of fact, drill hole data, where available, were used in conjunction with the electrical results to aid in the construction of most of the cross-sections.

Radioactive Tests Also Made

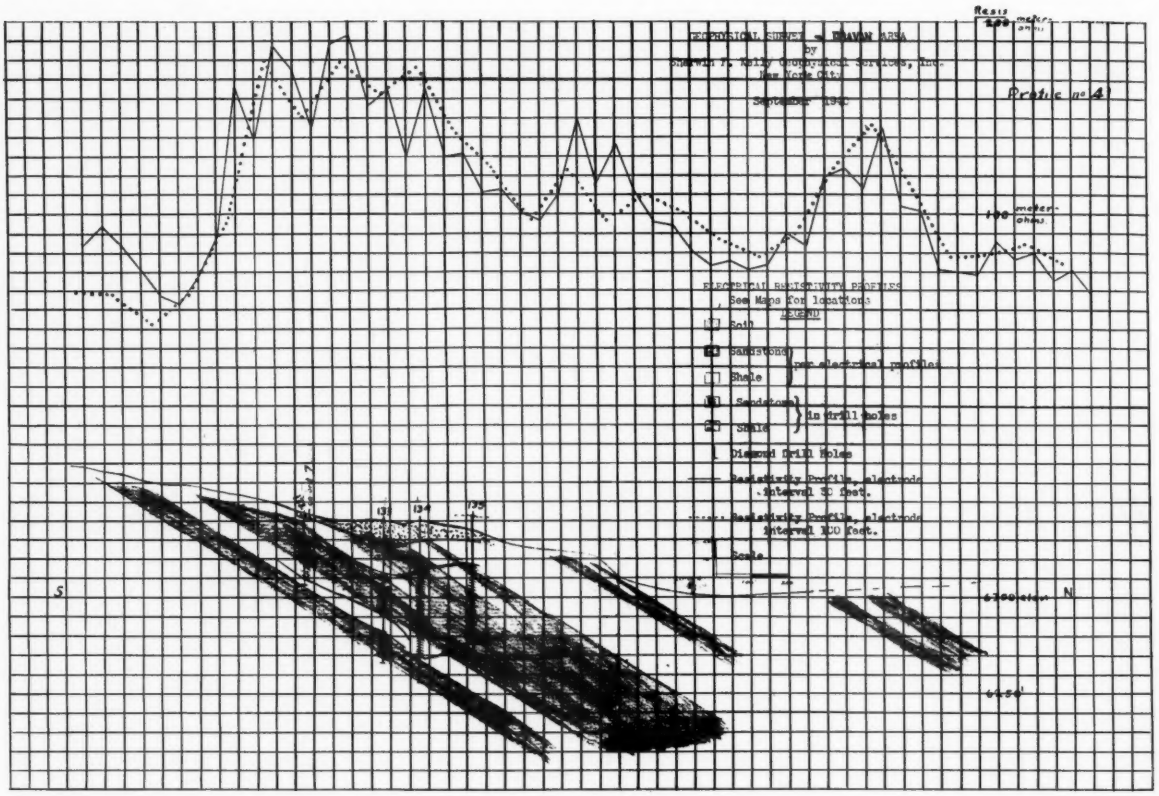
When tackling a prospecting problem, it is usually possible to employ more than one geophysical method. Wherever this is feasible, it is a procedure to follow, since the geological data deduced from the results of one technique will serve not only to check, but also to supplement those yielded by another method. The fact that a radioactive substance (uranium) occurs in the ores of this district, prompted us to investigate the possibilities of applying radioactive measurements in the study of these deposits.[6] The tests were in the nature of a preliminary trial, so extreme refinement of technique and accuracy of results were not aimed at. We desired merely to outline broadly the possible lines of attack, so the results will be sketched but briefly.

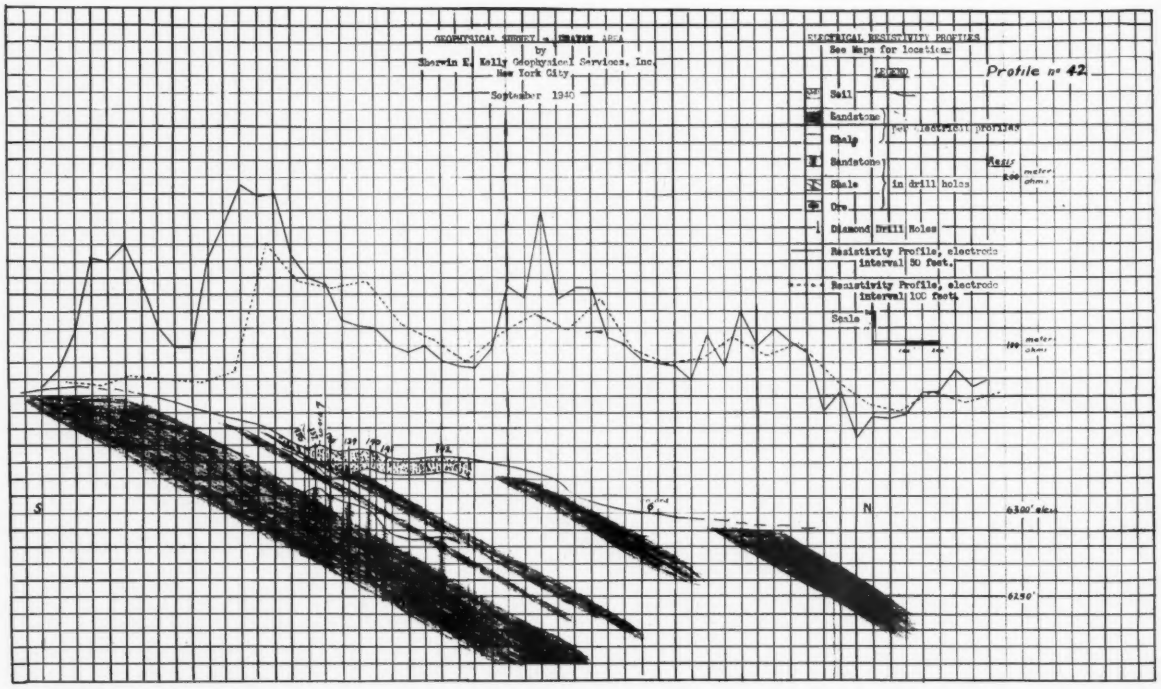
[6] Radioactivity by George Hevesy and F. A. Paneth; Oxford University Press, second edition, London, 1938. Radioactivity Tests of Rock Samples for the Correlation of Sedimentary Horizons, by H. Landsberg and M. R. Klepper; Trans. Amer. Inst. Min. Metall. Eng., vol. 138, Geophysics, New York, 1940.

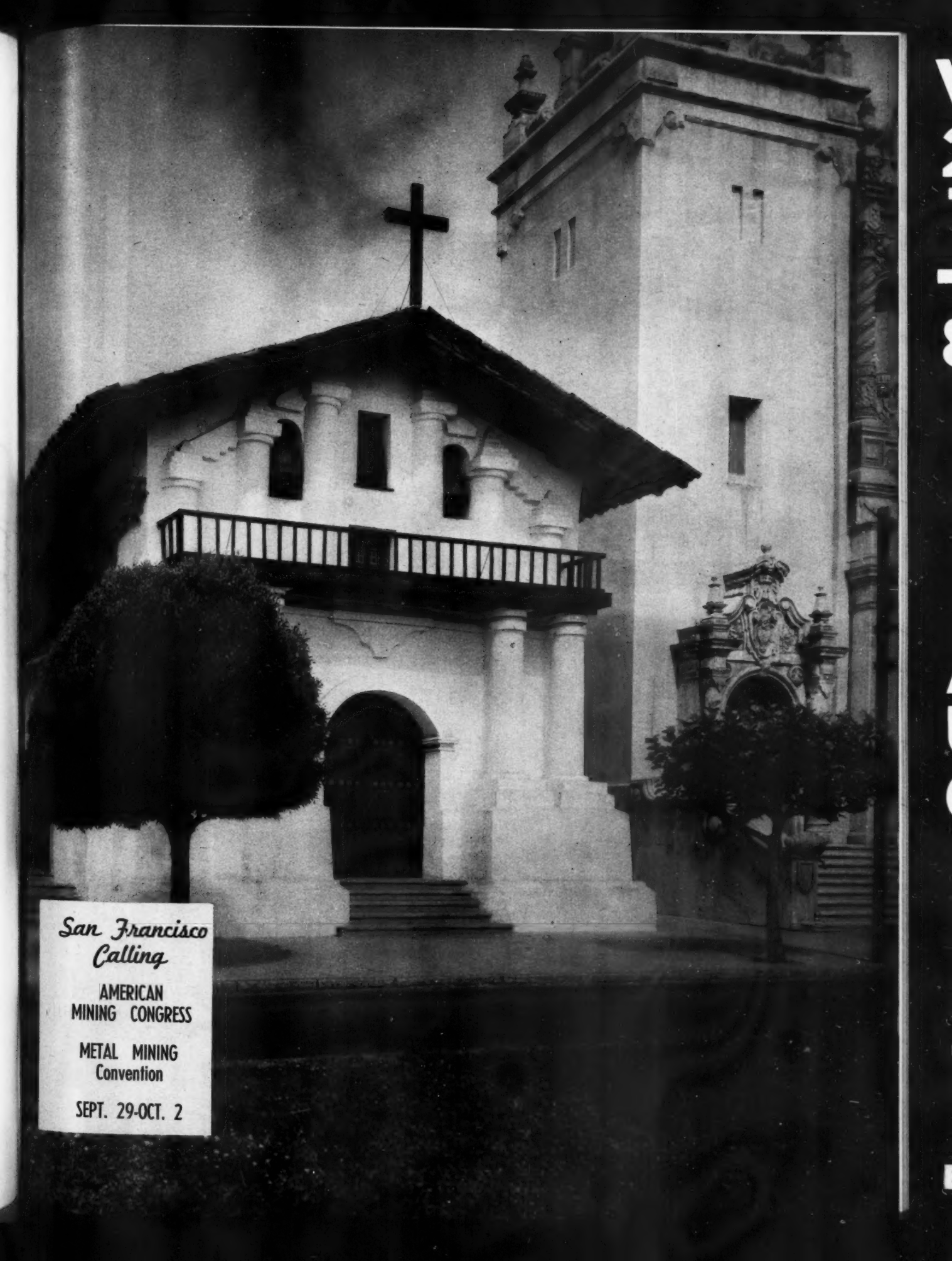
Through the kindness and cooperation of Professor Helmut Landsberg, assistant professor of geophysics at Pennsylvania State College, radioactive tests on surface soil samples were made in the geophysics laboratory of that institution. These tests proved that the soil radioactivity was in the form of alpha rays, not gamma rays, and that therefore the causative substance was probably uranium. Its distribution within the area investigated (near coordinates 6-E and 6-F), was such as to indicate that it was derived from the erosion of a nearby outcrop of an ore-bearing section in the sandstone. From this, the tentative conclusion is drawn that a systematic study of the distribution of radioactivity in the surface soils, horizontally and vertically, in conjunction with an examination of the erosion and drainage patterns, might serve to point to ore-bearing sections, either outcropping or concealed, within the main horizon.

Geiger-Muller Counter Employed

Studies were also made in the field with a Geiger-Muller counter, both underground and on core-samples brought up by the drill operating in this same vicinity. This counter measures only the gamma rays, and therefore detects the presence of radium, the radioactive disintegration product of uranium. Strong gamma-ray counts

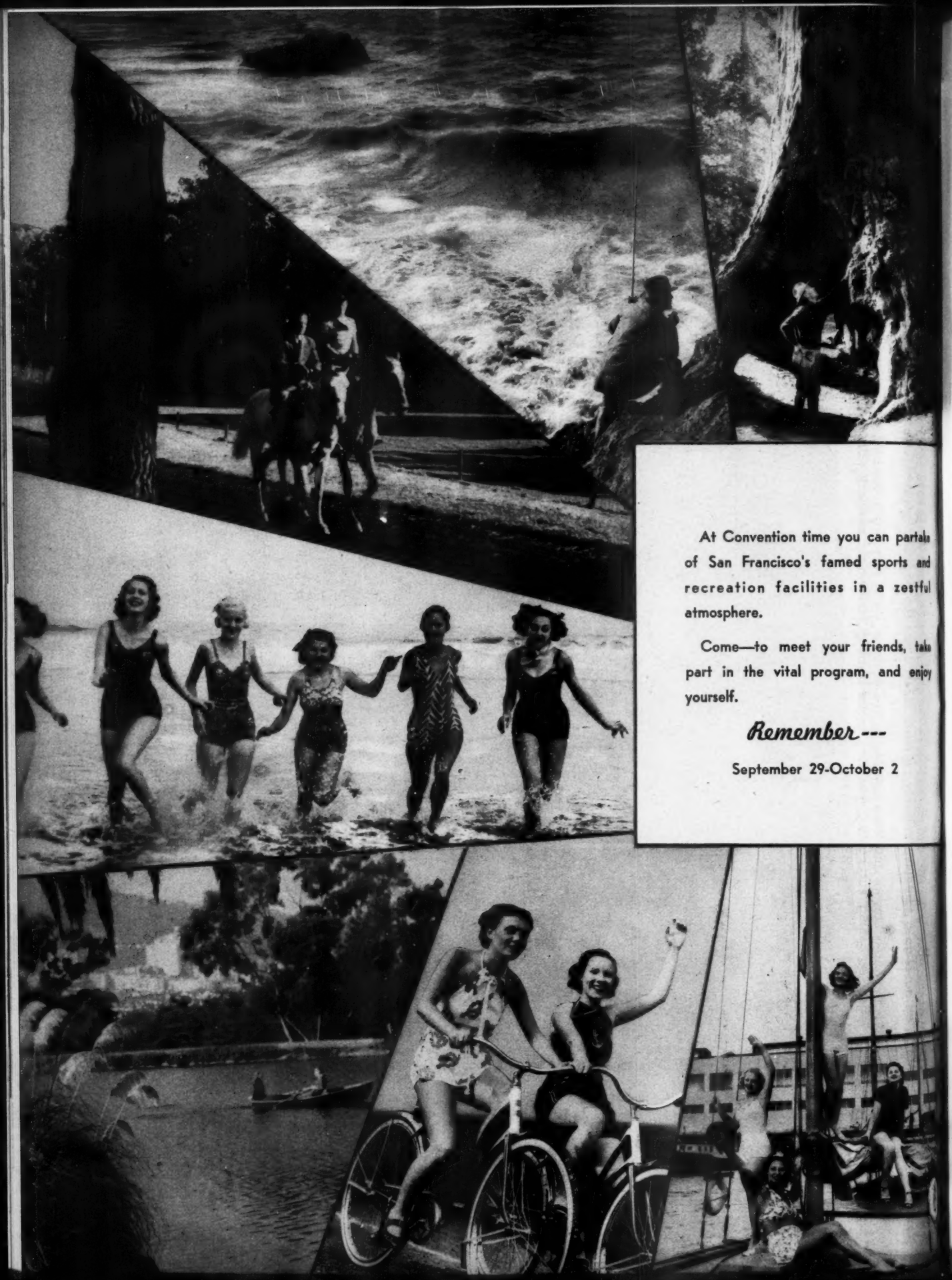

Profile nº 41
ELECTRICAL RESISTIVITY PROFILES
See Maps for location
LEGEND
Soil
Sandstone
Shale
Sandstone
Shale
} in drill holes
Diamond Drill Holes
Resistivity Profile, electrode interval 50 feet.
Resistivity Profile, electrode interval 100 feet.
Scale
S
N


GEOPHYSICAL SURVEY
by
Sherwin F. Kelly Geophysical Services, Inc.
New York City
September 1940
ELECTRICAL RESISTIVITY PROFILES
See Maps for location
LEGEND
Profile nº 42
Soil
Sandstone
Shale
Sandstone
Shale
} in drill holes
Ore
Diamond Drill Holes
Resistivity Profile, electrode interval 50 feet.
Resistivity Profile, electrode interval 100 feet.
Scale
S
N


San Francisco
Calling
AMERICAN
MINING CONGRESS
METAL MINING
Convention
SEPT. 29-OCT. 2

Above is the new Aquatic Park, where all-year, cool, healthful salt water is toning muscles and making bodies beautiful. Below is San Francisco's romantic Embarcadero, where ships from the Seven Seas meet railroads that network the nation. Above the city is one of the great Clipper ships that tie America to the Orient in regular passenger service.

Washed on the west by the surf and on the east by the glamorous Bay, and wrapped in an atmosphere never hot nor never cold, is an out-of-door paradise. Probably no other resort offers the vacation advantages of San Francisco Bay. Rivers, hills, Redwood trees, beaches, bays, meadows, palms, warm in winter, cool in summer, provide setting for golf unsurpassed, tennis amid flowers and trees that bloom in December as in July, lawn bowling, swimming, fly casting, bass fishing, open sea fishing, surf casting, yachting, motor boating, canoeing, horseback riding, hiking, mountain climbing.



At Convention time you can partake of San Francisco's famed sports and recreation facilities in a zestful atmosphere.

Come—to meet your friends, take part in the vital program, and enjoy yourself.

Remember---

September 29-October 2

were naturally observed on core-samples showing carnotite. A more significant fact, however, was that distinctive gamma-ray counts were obtained from apparently barren sandstone, cored from as much as 20 ft. above the ore stratum. Absolutely no signs of mineralization were visible in these samples, and I ascribe the radioactivity observed to the following mechanism. The first product of the radioactive disintegration of uranium is the gas radon, which is itself radioactive. As this gas emanates from the carnotite mineralization, it diffuses outward, and upward, through the sandstone. It has but a short half-life, and the product of its radioactive disintegration is the solid, radium. Therefore, as the gas radon decays, solid radium is deposited, not only within and close to the parent uranium, but also in the surrounding rock. It is this invisible deposit which gives rise to the gamma-ray count observed in the sandstone, even at a considerable distance from the visible carnotite. The same phenomenon is not found in the surface soils, because in this case the radon escapes into the atmosphere.

If the above deduction is correct, then a concentration of carnotite should produce around itself an aureole, or halo of invisible radon and radium. The presence of such a radioactive halo would manifest itself by gamma-ray activity, measureable with a Geiger-Muller counter. To test this hypothesis measurements were carried out underground along drifts in barren rock, and in workings which had laid bare some carnotite "logs." The presence of radioactive halos was well demonstrated, not only surrounding carnotite still in place, but also around the sites of logs which had been removed in mining.

The above results of these preliminary studies of radioactivity indicate that the techniques could be adapted to aid in surface prospecting, by locating areas wherein the soil exhibits radioactivity; to assist in orienting a drilling campaign through the study of drill cores, to determine when the drills are in the vicinity of a carnotite deposit; to discover, in underground workings, the locations of carnotite logs or other concentrations, which may occur as much as 20 feet back of the working faces.

Combination of Electrical and Radioactive Techniques Useful

A combination of electrical and radioactive techniques in a systematic exploration program, would probably prove a powerful tool in helping to solve many problems, arising from the prospecting for deposits such as these. Each technique would have to be applied with a clear realization of its limitations, and no attempt made to use them under conditions too difficult for their efficient functioning. Where the situation is favorable to their application, the electrical resistivity technique could be used as a reconnaisance, to locate zones favorable for ore deposition. Surface radioactive studies could serve still further to narrow the search, and during the drilling program, radioactive examination of the cores would help to orient its continuations. With the development of the orebody by underground workings, would come the routine application of radioactivity studies for the purpose of finding bonanzas of carnotite.

In any such program, whether on vanadium-uranium ores, precious metals, or base metals, the geophysical techniques should never be considered as the self-sufficient answer to any prospecting problem. They are but one method of gathering geological data, a point frequently overlooked but which should always be borne in mind. It is only by looking at the geophysical data in this manner, utilizing them in conjunction with all geological information available from other sources, that the maximum use can be made of either the geological or the geophysical data, in the formulation of a truly efficient exploration program.

The author making radioactivity measurements underground with a Geiger-Muller counter

Coal Division to Control Maximum Prices

The Bituminous Coal Division of the Department of the Interior on July 22 embarked upon a program looking toward the tightening of regulations governing regional marketing agencies and setting up machinery for establishing maximum prices for coals sold by such agencies whenever found necessary for protection of the coal-consuming public, according to a recent statement by the division.

Regional marketing agencies, when approved by the division, are central selling bodies, authorized to fix market prices for competitive coals. They are authorized by legislation when their activities do not violate the terms of division orders approving them. Such agencies are prohibited from fixing market prices below the minimum prices now in effect or above maximum prices should these be established by the division.

Machinery for establishing maximum prices and marketing regulations when necessary was made a part of the regulations contained in orders granting provisional approval to Indiana Coal Corp., Brazil Block Fuels, Inc., and Belleville Fuels, Inc., all with headquarters at Terre Haute, Ind., the three most recently authorized of the country's 14 regional marketing agencies. The division states that it is now studying regulations governing other marketing agencies, some authorized as far back as 1937, for the purpose of taking such action concerning them as it finds appropriate for more effective administration of provisions of the Coal Act providing for public protection.

Government Getting Placer Gold

A gold recovery plant was installed as a feature of the sand, gravel and rock preparation plant, built to furnish aggregate for the concrete of Friant Dam, one of the two great water storage structures of the Central Valley Reclamation Project in California.

It has now been announced that the recovery operations which began in August of last year have resulted in a production of $94,520 worth of gold to June 30 of this year, or nearly $10,000 a month. Expenses of recovering the gold were $18,534, including the cost of constructing the plant. Commissioner John C. Page of the Bureau of Reclamation recently reported that a check for $37,993 had been tendered to the Government as its share of the gold recovered from the sand and gravel processed.

CONVEYOR MINING at the Simpson Creek Collieries Company*

By JOSEPH M. CANNON

Resident Engineer
The Simpson Creek Collieries Company
Galloway, W. Va.

In planning mechanization of an operation, the management is faced with the problems of proper choice of type of equipment and mining method productive of best results under the particular conditions existing at the mine. The experiences of others in making these choices are of immense value. Mr. Cannon discusses not only the type of equipment and mining method his company decided to employ but, more important, the specific factors in the operation which led to those choices.

\+ + +

THE purpose of this article is not so much to describe the operating methods used at our mine as it is to outline the procedure followed in approaching the problem of determining the system of mechanization which would be most suitable to our conditions. A few years ago it became apparent to us that our company, along with the rest of the coal industry, was faced with the serious problem of meeting competition from other sources of fuel. In addition to this competition, there was the improved technique in combustion practices among coal users which further tended to reduce coal consumption, and made it necessary for coal mines to adopt more modern methods in order to combat these economic forces and provide additional markets.

Local Considerations and Conditions

In planning a program of mechanization, we had two major points to take into account or, rather, two phases of mechanization to consider. First, there was the question of applying mechanized loading to our present operating mine; next, there was the matter of an acreage of solid coal that was being held for future reserve. The present mine had been worked for many years by hand loading, and therefore had a number of main barrier pillars which contained a large tonnage of recoverable coal. However, these pillars, ranging from 400 to 500 ft. wide and cut by the old entries and airways, could not be mined economically by hand methods and some form of concentrated mining was necessary in order to produce a sufficient tonnage from these narrow areas to make mining profitable. We naturally decided that our going mine should be given first attention and our experiences there would indicate the plan that would later be adopted in the reserve territory.

The mines of the Simpson Creek Collieries are located at Galloway, Barbour County, West Virginia, and are working the Pittsburgh seam which has a height slightly over 6 ft. of excellent quality coal with fairly favorable mining conditions. There is, of course, the characteristic drawslate top which, as is well known, deteriorates after exposure to air and therefore requires very careful timbering and, in spite of timbering, there is always some expense for cleaning up slate falls. The pavement is a fireclay which becomes very soft under water. The seam has a high sulphur coal in the top 8 in. to 15 in. as well as occasional intermittent impurities; these must be removed from the market product, but this can be accomplished by hand picking at the face and on the tipple. The coal lies fairly level, with sufficient pitch for drainage, and severe grades are the exception rather than the rule. Vertical clay veins are sometimes encountered—varying from a few inches to 3 ft. or more in thickness.

Before deciding on equipment and the method of mining, we conducted an extensive investigation on mechanized loading operations already in use elsewhere. We realized that our property would have its own individual problems, but also we could take advantage of what had already been learned by other companies, and in this way, save ourselves unnecessary experimentation. The Pittsburgh seam in northern West Virginia, the Panhandle, eastern Ohio, and Pennsylvania has many operations with different types of mechanical loaders and conveyors which provided an excellent opportunity for observations under conditions quite similar to our own, and their study gave us an excellent background on which to form our own decisions.

A brief resumé of our lines of reasoning and our conclusions as a result of these investigations, may be of interest and help to others who are faced with similar problems. In presenting this resumé, our opinions as to equipment are based on application to our special conditions and requirements, and similar opinions and decisions would not necessarily apply to other properties than our own.

Factors Governing Decision for Conveyors

There are three basic types of mechanized loading—mobile mechanical loaders, self-loading conveyors and hand loaded conveyors; each of these was studied. As a general rule, mobile machines are used in seams above medium thickness—that is, greater than 4 ft., while conveyors are more generally operated in the thinner veins. However, we found there was no hard and fast rule in this particular; me-

* Extract of address presented to the Central West Virginia Coal Mining Institute, Elkins, W. Va., May 16, 1941.

chanical loaders are used in thin seams and conveyors in seams as thick as 5 ft. Coal height therefore could not be considered as an absolute determining factor.

In our opinion, it appeared that the type of operation we should adopt was determined by two seam characteristics (1) impurities in the seam which could be removed economically and satisfactorily by hand picking; and (2) bad top which requires close timbering.

Since we had no mechanical cleaning plant and at this mine did not want to go to the expense of such an installation due to a limited coal reserve in the existing mine, our choice of loading must be confined to a method of operation and equipment that would fit in with hand cleaning the coal. Only one type appeared to meet this condition—hand loading conveyors.

Conveyors also seemed particularly suitable for our roof condition. The rapid rate of advance would reduce the time of the roof exposure, and it was believed that a room would be completed before the deterioration of the top had progressed to the point of roof failure. In addition, the close timbering in a conveyor set-up would enable us to use more roof supports that would be possible with any other system, and therefore top could be held in place that would otherwise have to be taken down. Also, the conveyor line and the walkway would not require as great a clear width as track, and any falls that did occur could be gobbed and the expense of hauling rock to the outside would be saved.

In finally deciding to use conveyors it appeared that we were proceeding contrary to accepted practice because, as far as we could determine, hand loading conveyors were not being operated—at least in our field—in a seam as high as 6 ft. In thin vein mining, we learned from our investigations that one of the greatest advantages of conveyors was not in the loading of coal, but from indirect savings due to the elimination of rock brushing in the rooms and the elimination of track laying in a room for a comparatively small tonnage. We realized that in mining high coal we would not have these particular indirect savings but, in our judgment, conveyors would give us other economies which would equal those in the thin seams; thus reducing our drawslate costs and permitting hand cleaning. We therefore could see no reason why conveyors would not be just as successful in our thick coal as in the thinner seams.

Types of Conveyors

After we arrived at the conclusion to use conveyors, the first point was to determine whether these should be the self-loading or the hand-loading type. In making this decision, the method of cleaning the coal was the determining factor. As has been previously stated, the impurities in our seam can be removed by hand picking and this, in our judgment, meant that hand loading conveyors were indicated.

The next question was whether to use the chain or the shaking conveyors; each has its advantages and disadvantages. In our case, we felt that the soft pavement, particularly in the presence of water, was the determining point and that the shaker seemed more adaptable to our conditions. While it is true that a bottom of this type offers some difficulty in holding a shaker drive and the pan lines in place, we were afraid that the return flight of a chain conveyor would drag in the muddy bottom, causing premature sprocket wear and chain trouble and might bring dirt into the coal. Also, the shaker type would not require face conveyors in the pillar recovery.

Then, there was the question of single units or multiple units with a gathering conveyor and, judging from many examples of present successful operations, there was a wide range of choice. While a few companies still use the single unit, the predominating system is with multiple units; ranging from two to as many as eight or ten rooms coming to a common gathering point. The advantages of the multiple unit seemed obvious—a greater concentration of tonnage, the reduction in the expense of installing loading points, and the labor saved through having one man serve as car trimmer for a number of working places. Additionally, in case a room in a multiple system is idle for any reason, its crew can be transferred or divided among the other units. There is of course the disadvantage that a breakdown in the gathering unit means a shutdown of the entire system; this also applies when the loading station is being moved to a new location, but these disadvantages seemed far outweighed by the other savings.

In determining the number of room units that would be most economical for our conditions, we decided that four working places would be best. The decision in this respect was based on the size of the territory where the conveyors would first be installed, and to some degree on the fact that a shaker conveyor could be used as a gathering unit. A greater production of coal than four rooms would have involved the use of a gathering belt conveyor and for the time being, we preferred to confine all of our conveyor equipment to the same type; although the size of our gathering conveyor pans and drives is larger than those of the room units.

Plant at Galloway

Safety Considerations

Another factor which entered into our calculations was the matter of safety. Multiple cuts in a working face tend toward higher gas concentration in a limited area. Group working exposes more men to any dangers that may exist at a working face; the increased use of electricity also introduces new problems and the noise of the operating machinery sometimes prevents hearing warnings of an impending roof fall.

We recognized that all these hazards would be present, but a study of other mines seemed to show very clearly that closer supervision could insure the observance of safety rules, and that this, together with the provision of safeguards for moving machinery and proper electrical installations, could be depended upon to provide adequate safety for our men. Records which we examined, from state re-

ports and individual companies proved conclusively that mechanized mines could be operated and were being operated with better safety records and lower accident rates than where hand loading is practiced.

Plan of Mining

Our final problem was the decision of the mining system, and here again we had numerous examples to draw from. Systems now in use range from wide rooms, 50 ft. and greater, with thin pillars left unmined; rooms of medium width—30 to 35 ft. with pillars of corresponding thickness that are recovered; narrow rooms, 12 to 18 ft., with pillars 40 ft. and more in thickness. Pillar recovery methods vary among open end, cross cuts and longitudinal slabbing. However, in the final analysis it was our opinion that top conditions at our mine should govern the system selected, rather than to attempt some innovation which has proved successful elsewhere.

The mining plan adopted is the familiar "block system," which is used quite extensively in our field, and its application to the recovery of a main barrier pillar is shown in Figure 1. As will be noted, rooms 14 ft. wide are driven on 75-ft. centers, which develops blocks of solid coal approximately 60 ft. square. These blocks are then recovered by crosscuts. In this sketch, the shaded entries indicate the main and butt headings that had been driven for the hand work. These, as will be noted, are located slightly off the center of the 450-ft. main barrier.

It was not considered feasible to use the old airways for the gathering track and the gathering conveyor, as slate had fallen in these places and there would have been considerable expense for cleaning. The main line track, however, is left in the haulageway to aid in moving the room conveyors and also to simplify delivery and placing material; this is recovered before a roof fall occurs in the adjoining pillar work.

The plan adopted is to drive a new entry 75 ft. to the left of the main haulway for the gathering track and for the mother conveyor, as shown in the sketch. The rooms to the right off this entry to the gob line are 300 ft. long, which is considered an economical length for a room unit. The coal to the left of the gathering entry is 150 ft. wide, which is the correct distance for two standard blocks and these in turn are worked by a 300-ft. room conveyor which, however, drives parallel to the gathering entry. This arrangement gives four rooms, each the standard 300-ft. length, all working simultaneously and discharging onto the mother conveyor.

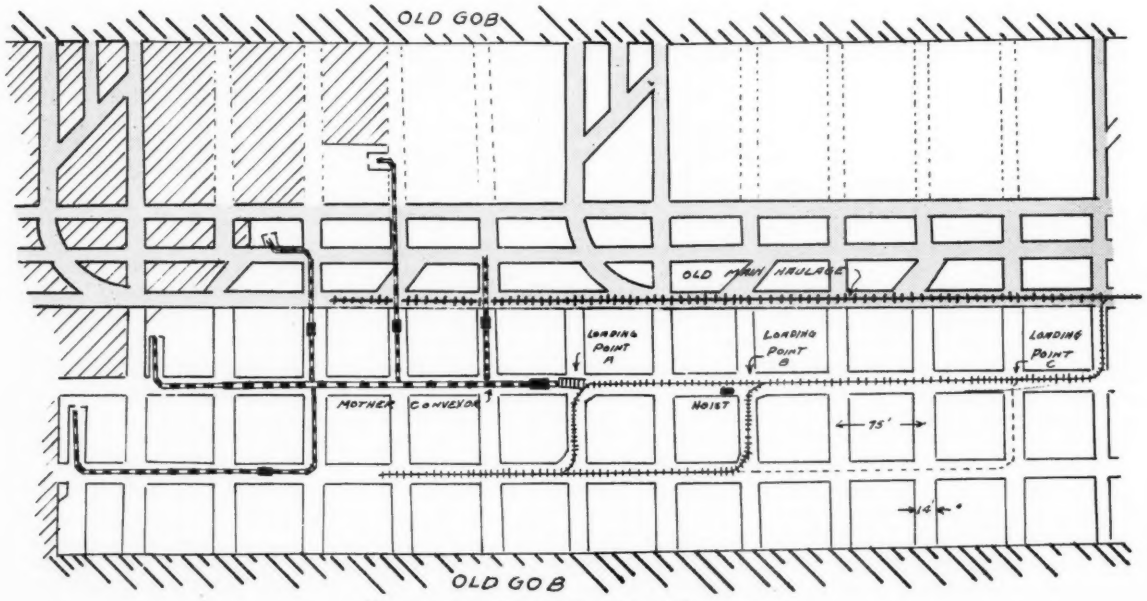
Plan Provides Flexibility in Mining Room Units

It will be noted there is a certain amount of flexibility in the location and the arrangement of the room units and, in addition, the end of the mother conveyor, through a 90-degree turn, may also be used to recover the blocks. This gives an extra working place when one of the rooms is idle for any reason, and permits maintaining the standard production of a four-conveyor unit at all times. The method of pillar recovery is by driving 14-ft. crosscuts through the pillar, leaving a small curtain of solid coal against the gob. After the crosscut is driven through, it is widened by slab cuts, removing most of the curtain pillar and slabbing on the outbye side if the top permits.

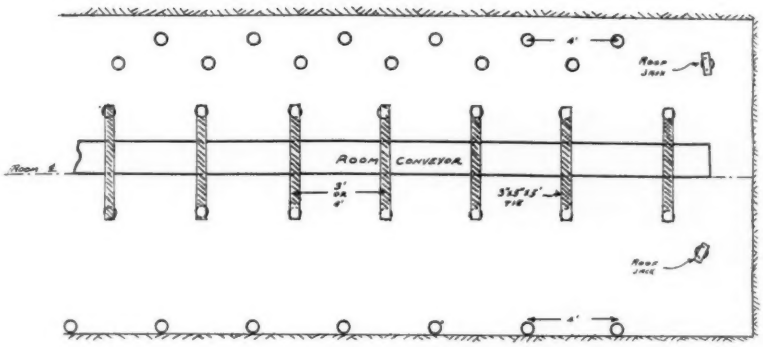
It will be noted that loading points are placed at every second crosscut. When mining has reached the point where it is necessary to set a conveyor in the room at loading point "A," the drive for the mother conveyor remains as now shown, but the conveyor pans from the tail end are placed in front of the drive so as to extend down to loading point "B." This arrangement eliminates the necessity of moving the loading point at each crosscut and reduces by one-half the number of loading station setups that would otherwise be necessary. About 18,000 tons of coal are mined before making a major move with the mother conveyor.

Timbering is Carefully Planned

Figure 2 shows the usual timbering plan for the 14-ft. rooms. The conveyor is protected by posts and cross bars, and a line of posts with 3-in. by



Plan for recovering barrier pillars with conveyors



Timber arrangement for tender roof

5-in. caps is set near the rib on the right hand side, which leaves a free walkway along that side of the conveyor. The opposite side of the room is heavily posted and gob is stored here. Two roof jacks are used at the face and are moved ahead after the permanent timber has been set.

The size of the cross bars over the conveyor will vary according to roof conditions. Where the top is not particularly heavy, 3-in. by 5-in. by 5-ft. mine ties are used as headers above the conveyor line. These modified cross bars are set on either 3- or 4-ft. centers. With heavy roof, round cross bars 6 in. to 8 in. in diameter and 12 ft. long are used, spaced on 3-ft. centers. An additional post is set under the bar near its center and posts with half headers are placed between the round cross bars where necessary. This close timbering eliminates lagging over the bars and is a method which could not be followed with hand loading. In the crosscuts on pillar recovery, the same general plan of timbering is used as in the room work.

Operating Equipment and Results

The equipment for the set-up as shown in Figure 1 consists of 1,200 lineal feet of 12½-in. shaker conveyors with four drives; 300 lineal feet of 20-in. shaker conveyor with drive; and one chain elevating conveyor which loads into the mine cars. These were furnished by the Goodman Manufacturing Company. Each room unit has a Goodman shortwall cutting machine, a Jeffrey electric hand drill and Simplex mine roof jacks. Ohio Brass Company Type B junction boxes are used for the power cables and a Brown Fayro rope hoist moves the mine car trips at the loading point.

The operation has a regular crew of 12 face men, 1 car trimmer and 1 foreman. In addition, one trackman is employed and a motorman is used for 70 percent of a shift. This makes a total crew of approximately 16 men per shift for all work in the panel.

The conveyors were put in operation in June, 1940, and have been entirely satisfactory. The work is on a three-shift basis, and the average rate of mining has been 15 ft. per shift for room advancement and 3 ft. per shift on pillar retreat.

Five Years of Coal Cleaning Experience

(*Continued from page* 26)

1/16-in. thick stainless steel plates onto the face of the blades and spider arms in March, 1939, there is not yet, after 28 months, or some 1,500 shifts, any material wear shown on these plates. In the case of dewatering screens and dryer decks, the life of the stainless steel is more than 10 times that of carbon steel, and three to six times that of either hard brass or phosphor-bronze. A stainless steel shaft, impeller and rings in No. 1 recirculating pump have been in continuous service for two years, which is three to four times the life of the original brass equipment. This is a 12-in. discharge centrifugal pump handling about 4,000 gallons of rewash water against a 55-ft. head.

Two rubber-lined "Hydroseal" pumps, with rubber impellers, for recirculation of wash water and slurry disposal, were installed in 1939, and have increased considerably the normal period of operation, without requiring overhaul or renewal, over that of the standard pumps with cast iron casing and brass impellers formerly used.

In the case of elevator buckets and chains, the answer has not yet been found. Stainless steel, so far, has been considered too expensive for this service. Comparative tests are being made continuously with various special alloys and metals furnished by different manufacturers of this type of equipment, but none has yet shown enough superiority in service to warrant adoption.

Incidentally, neither the recirculating water, nor waste water, in this plant is acidic. Both show a pH value of 8, which is slightly alkaline.

Clarification of Waste Water Now Being Studied

Finally, the most recent problem to arise and that is now being studied, is that of clarifying the waste water being pumped from the plant to settling ponds, but which fails to clear up by gravity settling. In fact it is still dirty in appearance after percolating through the gravel beds beneath the settling ponds. A number of flocculating reagents, including starch solutions, hydrochloric acid, ammonia alum, potash alum, and aluminum sulphate, have been tested in the laboratory with varying degrees of success. Of these, however, aluminum sulphate gave the most promising results, and this reagent is now being tried out on the current discharge of waste water from the plant. The volume of this dirty water runs about 150 gallons per minute, and carries an average of 4 percent of solids. This is a relatively small quantity of material but state law prohibits its discharge into any fresh water stream. The problem is therefore to find the cheapest possible flocculating agent to precipitate it in the settling ponds.

West Virginia Mine Reopened

The former mine of the Landstreet-Downer Coal Company, on Rockhouse Creek above Delbarton in Mingo County, W. Va., which has been idle for more than five years, is to be reopened and operated by the Lando Coal Corporation. A new railway siding is being constructed and a modern coal washer will be installed at the tipple, and actual shipment of coal is expected to start soon.

All loading, it is understood, will be with mechanical loaders and the mine will operate on three seven-hour shifts per day, and the tipple on two shifts. Between 200 and 250 men will be employed when the mine starts shipping coal.

A Great Lakes iron-ore carrier, typical of the large fleets now efficiently keeping our iron and steel industry supplied with ore

Photo by Carl McDow, Cleveland

ST. LAWRENCE PROJECT and the MINING INDUSTRY*

Hearings on the controversial St. Lawrence deep waterway and power project have been held by the Rivers and Harbors Committee of the House of Representatives since June 17. In the accompanying statement the Secretary of the American Mining Congress summarizes the position of the mining industry and its reasons for urging that the project be not undertaken. He emphasizes the peril to our mineral industries and to the future security of the United States.

By JULIAN D. CONOVER
Secretary
American Mining Congress

THE mining industry has consistently held the view that the Great Lakes-St. Lawrence Deep Waterway and Power Project was unwise and harmful to the best interests of the country. Resolutions opposing it have been adopted at meetings of our Coal Division, representing a substantial majority of the nation's coal production; at our Western or Metal Mining Conventions, representing approximately 90 per cent of the various metals produced in this country; and at the annual meetings of the national organization, representing the combined views of the mining industry. The following resolution was adopted at our annual meeting in January, 1939:

"We oppose the pending treaty with Canada providing for the construction of a Great Lakes-St. Lawrence deep waterway and for immense hydro-electric power developments. The project has no economic justification, the proposed transportation and power facilities being neither needed nor desirable. It would impose unwarranted additional tax burdens. It would be of principal benefit to foreign production and shipping at the expense of American industries, agriculture, railroads and water carriers. Millions of tons of American-produced commodities, particularly coal, iron ore, and metal products, would be displaced through the invasion of the vast interior American market by heavy imports from countries having low living-standards, forced labor, and government-subsidized commerce. Markets for large tonnages of coal would be closed by the huge surplus of hydro-electric power and by lessened fuel requirements of our railroads and water carriers. The project would tend to disrupt and demoralize a great section of our economic life, producing serious unemployment and reduction in living standards, and to destroy great mining, metallurgical, and other industries which are vital to the welfare and self-sufficiency of our country."

This was reaffirmed in 1940, and again at our meeting in January, 1941, in the following terms:

* Statement presented before the Committee on Rivers and Harbors of the House of Representatives, July 24, 1941.

"We reaffirm our opposition to this project. Of doubtful benefit to American economy, it would obstruct national defense by diverting money, men and materials from immediate vital needs, and would create in itself a new vulnerable area requiring vast defense works."

The mining industry sees, in both the navigation and power proposals of this project, threats to its well-being and to the very existence of some present mining operations. In addition, the enormous ultimate cost of the project—including the necessary deepening of harbors, construction of port facilities, interest charges, etc., which are not included in published estimates but which would apparently raise the total to well over a billion dollars—would place an unwarranted tax burden upon the already overburdened taxpayers of this country.

Time Element All-Important—Advantages of Steam Plants in Supplying Power for Defense

With reference to the proposed power developments, we support the general conclusions presented to this committee by Mr. B. D. Tallamy. We hold that whatever additional power is needed for defense production should by all means be provided, and should be provided *at the earliest possible date.* Power made available this year or next is vastly more valuable than power which cannot be utilized until 1945.

From the standpoint of national safety, time is all-important. A small additional cost for generating the needed power would be of negligible consequence compared with its early availability. We submit that modern, coal-fired steam generating plants can be built in a fraction of the time required to complete the proposed hydro-electric power facilities in the International Rapids section, and at far less cost than the overall cost of the seaways project. Steam plants can be located at or close to the points where the power is required, without the necessity for costly, long-distance transmission lines. Depending on location, they can serve the needs of ordinary manufacturing industries at lower cost, or at only minor increases in cost as compared with St. Lawrence power. The immense coal reserves of this country are ample to meet any such demands, which will also give additional employment to mine workers now unemployed. The building of steam plants at strategic points, independently operated, likewise accords far better with the basic military policy of decentralizing rather than concentrating defense production.

Tremendous installation at Presque Isle, Ohio, for unloading iron ore from vessels

Photo by Wellman Engineering Co., Cleveland

Additional Power Facilities Already Available in St. Lawrence Valley

In case it is considered essential that additional high-load-factor energy be provided in northern New York State from hydro-electric sources, we submit that quantities comparable to the amounts estimated for this purpose in the Department of Commerce Reports on the St. Lawrence seaway are readily available through additional diversions at Niagara Falls, utilizing idle generating capacity already installed, and through purchase of power from the existing Beauharnois plant in Quebec. We are confident that an impartial analysis of these sources will show an ample power supply, to be had in far less time and with far less expenditure than from the St. Lawrence project.

Keynotes of our national defense effort are the slogans, "It's later than you think" and more recently, "We only have months." Amplifying this Leon Henderson in a thought-provoking article in *Fortune* this month says, "We've got months, not years, in which to prepare." The urgency is too great to gamble with defense. We urge you, therefore, if more power is needed, to secure it through the measures which we have pointed out, which not only save precious time, but which involve vastly less diversion of essential materials, man-power and engineering talent from the vital requirements of our defense program.

Proposed Waterway Would Injure American Industry

As a navigation project it is our belief that the proposed deep waterway is not only unnecessary, but would seriously injure established American industries, workers, agriculture, railroads and shipping, without compensatory benefits.

Too often the waterway is portrayed as an *outlet* to world markets for American products, and the fact is ignored that the great interior reaches of our country are themselves the richest and most coveted market in the world. We believe the major significance of the waterway would be as an *inlet* to the heart of America for the products of cheap foreign labor. Analysis of the project indicates that American producers of agricultural, mineral and manufactured commodities may expect to find the primary benefits accruing not to themselves but to their foreign competitors. The desperate economic condition into which the rest of the world already finds itself plunging points to post-war competition for world markets—especially from the over-expanded plants of an impoverished Europe—which Americans, with their accustomed high-wage and living standards, will find it exceedingly difficult to meet. A government-subsidized channel to carry such competition direct to their largest market will not then add to domestic economic security.

This problem is one in which we of the mining industry are deeply concerned, but it also bears directly upon our ultimate security and strength as a nation. It has to do with whether we shall continue to be self-sufficient in respect to our most basic raw material, or shall become increasingly dependent upon supplies from across the seas.

In the Great Lakes-Mississippi Valley area we have built up an iron and steel industry which is the most productive in the world. This industry is based upon the huge deposits of iron ore in the upper Great Lakes region, the splendid supplies of metallurgical coal and fluxing materials in the Appalachian and Mid-Western states, the efficient lake and rail transportation which brings these together,

and the proximity of a major part of our consuming population.

The iron and steel thus produced are the backbone of modern industry and of national defense. The greatest single factor in the industrial strength, and hence the potential military and naval strength of our country, is the fact that we have both the mineral raw materials and the plant capacity to supply our own requirements for iron and steel. Continued self-sufficiency in this respect is essential. Our national security demands it.

Of our iron ore requirements, 85 percent comes from the great ore bodies of the Lake Superior District, in northern Michigan, Wisconsin and Minnesota. Accompanying this statement is a map showing the movement of iron ores from the iron ranges of these states to the various points of consumption. Practically all of the Lake Superior ores go to blast furnaces west of the Alleghenies. Plants near the eastern seaboard are supplied chiefly by high grade foreign ores, imported from Chile, Cuba, Sweden and other countries—these imports also being indicated on the map. The small figures on the map show the extent of the various movements, in thousands of gross tons, for the year 1937. In that particular year, the eastern furnaces received abnormally high quantities of Lake Superior ores, because of a threatened tie-up of shipping on the Atlantic seaboard due to labor difficulties. A more representative picture is given by considering the 10-year period 1930 - 1939 inclusive, during which the total shipments of Lake Superior ores to points east of the Alleghenies, including the abnormally high 1937 movement, were only 2,497,278 tons, and accounted for only 6 percent of the pig iron production of eastern furnaces—the bulk of these furnaces' requirements being supplied from foreign sources.

Invasion of Interior Markets by Foreign Iron Ores

Foreign supplies of iron ore, of high grade and readily accesisble to ocean transportation, exist in enormous quantities. In addition to the countries I have mentioned, there are billions of tons in Brazil, available for cheap mining and rail transportation by a downhill haul all the way to the Coast. Much of the ore is practically pure iron oxide, with extremely minute percentages of impurities. I spent a year making engineering examinations of these deposits, and can personally vouch for their quantity, quality and accessibility. Other immense reserves are found near the Black Sea in Russia, in Newfoundland, and elsewhere around the world.

Studies of the proposed waterway show that the principal incoming cargoes would consist of bulk commodities, such as iron ore, coal, oil, and crude and semi-finished iron and steel products, besides agricultural products. Prior to the present war, even with the existing 14-ft. St. Lawrence channel, some shipments of iron ore from Sweden came to Buffalo each year. The deeper channel would unquestionably encourage large-scale importations of the high-grade foreign ores to our Lake ports for use by inland furnaces. A comparison of labor costs will show clearly that such imports constitute a real and not an imaginary danger.

We do not want to see the encroachment of foreign ores which has largely pre-empted our eastern seaboard market extended to the furnaces in the lower Great Lakes region by making seaports of the Great Lakes harbors. We wish to emphasize, as strongly as we can, *first*, the harm this would do to a great mining region; *second*, the resulting discouragement to further developments now under way by which billions of tons of previously non-commercial iron deposits may be utilized; and *third*, the potential danger this entails to our national security. Let us take up each of these briefly.

Entire Great Lakes-Central Valley Area Would Suffer

As to the first, may we point out that the total investment in the Lake Superior iron ore industry, including mines, railroads from the mines to upper lake ports, ore loading docks, and lake vessels, exceeds $600-millions, exclusive of unloading facilities on the lower lakes. The industry pays in wages and ore handling charges approximately $150-millions a year. It pays local and state taxes of about $30-millions, not to mention Federal and other taxes. A population of nearly 200,000 persons in the iron country is directly dependent upon it, and indirectly it supports a very large additional population.

To the extent that foreign iron ores, produced by low-paid or forced labor, are permitted, or even encouraged, to supplant the Lake Superior ores, this entire region suffers. It must either lose its source of livelihood or wages and living standards must be cut to meet this drastic competition. In either case, there is loss of markets to farmers and merchants, loss of returns to investors, and loss in taxes to federal, state and local governments.

In addition to iron ore it is to be expected that pig iron, cast iron pipe and semi-finished steel products, from the greatly expanded plants of a post-war Europe, would take full advantage of the St. Lawrence entry to our great interior market. The effect of such competition would be felt by millions of persons. The whole economic life

Unloading a Great Lakes iron-ore carrier

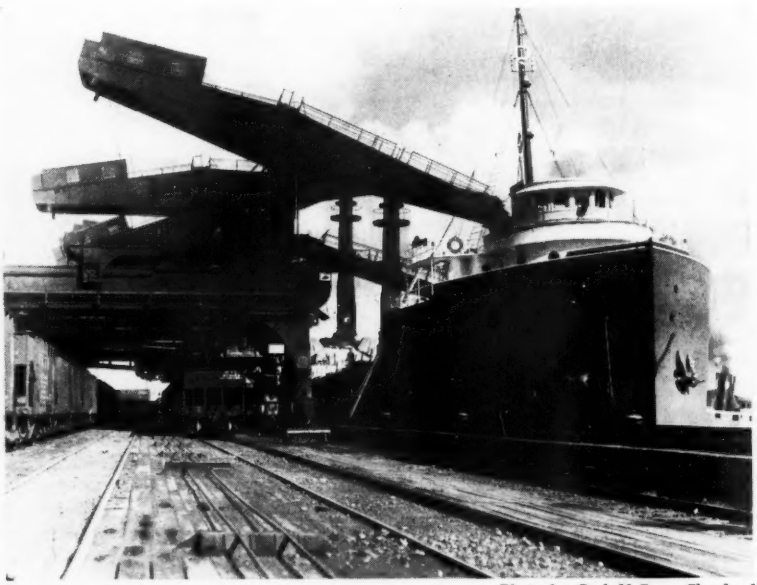


Photo by Carl McDow, Cleveland

of the Great Lakes-Central Valley area largely revolves around the iron and steel industry, and most of our other industries are related to it, either as sources of supply, as carriers, or as manufacturers and consumers of its products. As to minerals, the iron and steel industry provides a major market not only for iron ore and coal, but for other branches of mining, such as limestone, fluorspar, refractories, manganese and other ferro-alloy minerals, and zinc, which normally finds its largest outlet in the galvanizing of steel products. Our farmers and stock growers find their principal market in our mining and industrial regions rather than in the population of lands overseas. Elimination of the natural geographic protection of this vast inland empire, in our judgment, would injure a far greater proportion of persons and enterprises than could possibly be benefited.

To suggest that ruinous imports of iron ore and its products might be avoided by imposing a sufficiently high tariff would appear to us to be begging the question. If tariffs are to be fixed so as to prevent bringing in those commodities for which the waterway is best adapted, the whole project seems futile and illogical.

Beneficiation of Our Lower Grade Iron Deposits Should be Encouraged

In the second place, we now have going on in the Lake Superior mining district one of the great developments in mining and metallurgical science, which should be encouraged to the fullest extent. This involves the beneficiation of low-grade iron deposits which have previously been regarded as worthless because their iron content was not sufficiently high for blast furnace use.

About 10 years ago, predictions were rife that the ore bodies of commercial grade then known, plus additional discoveries which might reasonably be expected, would be exhausted in the comparatively short span of a few decades; also that the mines' productive capacity would decrease long before that time, and that foreign ores would be needed to supplement domestic production. Writers on the St. Lawrence waterway have used this assumption and prediction as one of the principal arguments in support of the project.

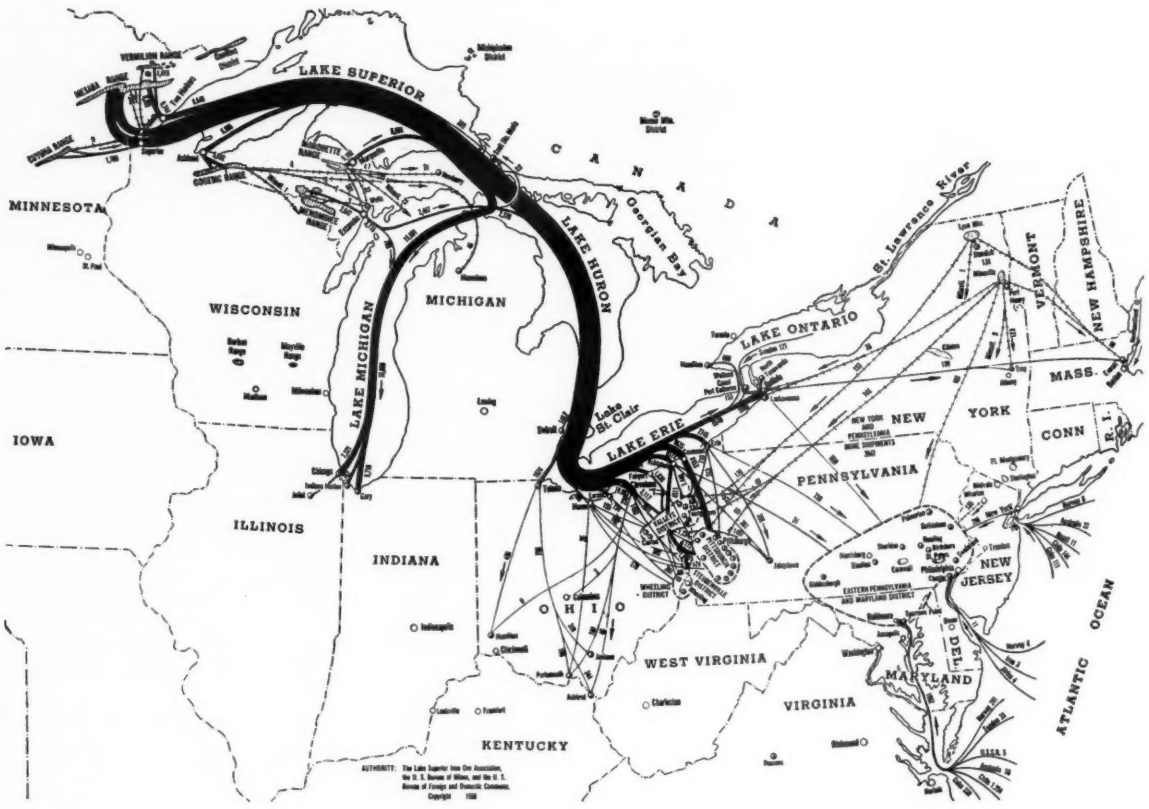
Today, however, through the initiative, enterprise and engineering skill of our mining organizations, such predictions are headed for the discard. Already nearly one-half of the ore shipped from the Lake Superior district is beneficiated in some manner, and one-sixth is subjected to processes of concentration—washing, jigging, sintering, magnetic separation, heavy-density treatments, etc.—which eliminate impurities and raise the percentage of iron content so that the ore may be successfully handled in the blast furnace. By the extension of these processes and the development of further techniques, it is now apparent that many billions of tons of iron-bearing rocks, of lower grade than those now being mined, can be converted into a commercial product. The life of the Lake Superior district and its ability to supply our iron and steel requirements can thus be extended almost indefinitely into the future.

We must emphasize, however, that these developments require years of effort, heavy capital outlays, and continued application of metallurgical skill, research and enthusiasm in overcoming obstacles. We cannot expect the processes to be perfected nor the immense investments in treatment facilities to be made unless those engaged in iron mining can foresee a reasonably assured future. If their market in the lower lakes is to be usurped by seaborne ores, produced in countries with living standards and transported on vessels with working conditions and wages such that no American would care to compete with them—moving over an uneconomic, government-subsidized waterway—initiative will be discouraged and progress throttled. If on the other hand, ocean shipments of iron ores are confined to their natural markets on our seacoast, and the incentive to improve our metallurgical processes is preserved, we may expect continued and successful effort and expenditure in making available our tremendous reserves of lower-grade iron-bearing materials, and the maintenance of our present independence and self-sufficiency in this fundamental resource.

Continued Domestic Development Vital in Times of War

Third, the bearing of these facts on our security as a nation is self-evident. I should hate to think where we would be today if our domestic mining industry were not in a healthy and vigorous state. Without the 75 million tons of iron ore—a record for all time—which this year will move down the lakes to the furnaces and steel mills,

One of the large open-pit iron mines, Minnesota



Graphic representation of the movement of iron ores in the regions of the Great Lakes and the Atlantic coast. Chart furnished through courtesy of Lake Superior Iron Ore Association

we should be hard put to build the ships, tanks and other arms needed in our present supreme effort. We may be thankful that we have an adequate supply of this No. 1 raw material of modern industry, without precarious dependence on ocean shipping. Even today we are dependent on distant sources for tin, chromium and other strategic metals, but we simply cannot afford to become dependent on foreign lands for a bulk commodity like iron ore. Our great integrated iron and steel industry was indispensable to the winning of the last war; it is indispensable in the present crisis, and we must preserve self-sufficiency if we would maintain the industrial strength without which we cannot defend ourselves in the future. We urge you not to jeopardize that strength by starting on the road which leads to dependence on foreign iron ores.

Struggling Coal Industry Heavily Penalized if Waterway is Constructed

Coal is another mineral commodity entering into every phase of our life, and vital to national defense, which is deeply concerned over the St. Lawrence proposal. Bituminous and anthracite coal together give employment directly to some 600,000 men, and indirectly to many times that number. The total investment in coal mining properties is in the neighborhood of $3.5 billions. With a production this year of 600 million tons, coal will pay in wages about $850 millions. Coal is the greatest single commodity hauled by the railroads, and its ramifications are so great that most of our population is, or should be, concerned with its welfare.

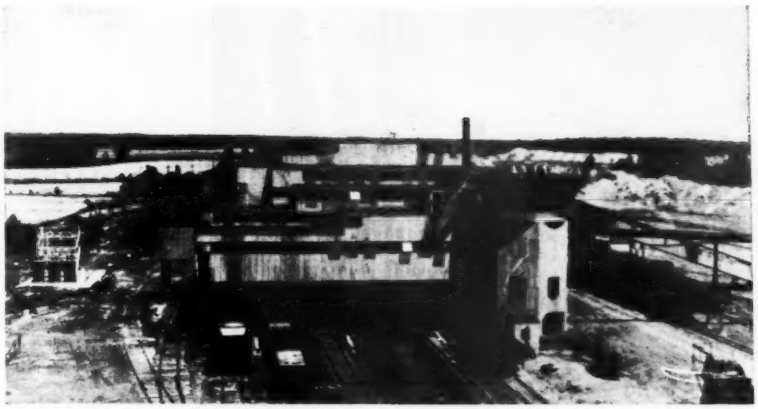
Improvements in coal-fired steam plants have made the cost of power thus generated compare most favorably with the cost of hydro-electric power. We have previously suggested that such plants, strategically located, will better answer the urgent needs of the defense program than hydro-power from the St. Lawrence project, which cannot be made available until much later. They will also provide a continuing market for more than five million tons of coal which would otherwise be preempted by the St. Lawrence project.

Considering the proposed waterway, coal is another of the bulk commodities which would inevitably be brought from foreign countries into the inland markets of this continent at ballast rates. Crude petroleum and fuel oil from South America, which have largely invaded our eastern seaboard, would likewise enter with ease the interior ports of both this country and Canada.

We may anticipate that such imports would largely preempt the Canadian market for American coal, which has normally amounted to some 10 to 15 million tons annually, and would also displace large tonnages of domestic coal in our own Great Lakes basin. There is no tariff protection against the heavy coal production of eastern Canada, Britain or Russia, and the small excise tax of ½¢ a gallon on imported fuel oil was recently reduced by 50 percent.

In addition to the direct loss of tonnage to foreign coal and oil, the waterway involves further loss of important coal markets. To whatever extent it diverts traffic from our present efficient railway system, coal consumption by the railroads would be curtailed, with corresponding loss of revenue to our mines and miners. Likewise, any reduction of industrial activity in this country, resulting from increased imports of steel or other products, would find immediate reflection in decreased demand for coal.

It is difficult to make an accurate prediction of the total direct and indirect losses, but 50 million tons annually would not seem an unreasonable figure. The loss of this tonnage would take $100 millions from the gross returns to the coal industry, of which fully $60 millions constitute wages paid to labor. Depriving the railroads of this traffic would take some $110 millions from their revenues, of which approximately $45 millions represents wages to labor. Every million tons of coal displaced means the loss of a million man-days to those employed in the mining, transportation and sale of coal. Neither the bituminous nor the anthracite industry has known prosperity for many years, and they can ill afford to lose such an important part of the market for their products.



The coal industry, typified by this modern plant in Illinois, would be vitally affected by the Seaway

Inauguration of the St. Lawrence project would darken the outlook for the future and be a bitter blow to those responsible for coal production. It could not help having a discouraging effect upon the industry and its capacity to meet a national emergency. Although we have ample coal reserves for a long future, it is essential that our mines be kept in position, from both an operating and a financial standpoint, to expand production quickly when the need arises. Depriving them of natural markets and customers will not contribute to this result. On the other hand, it will tend to deter and discourage development of coal mines today which may be badly needed in the future.

We trust the committee will give serious thought to the harm which is inherent in the St. Lawrence project to our great mineral industries, to those dependent upon them for a livelihood, and to those concerned with their welfare. We hope you will not take action which would jeopardize the self-sufficiency of the United States in respect to those basic mineral resources which are indispensable to our national safety in the existing and in any future emergency.

Preference Rating A-3 For Mining Machinery

To facilitate the production of mining machinery and equipment, which is of crucial importance to the defense program, and following representations by the American Mining Congress and manufacturers, E. R. Stettinius, Jr., Director of Priorities, recently issued a limited blanket rating to 40 manufacturers of this equipment.

The rating provided in the order is A-3 and is applicable to all deliveries of materials which appear on the Priorities Critical List, unless a higher preference rating has been given to some particular item, in which case the higher rating may be applied. Provision is made for the extension of the A-3 rating to subcontractors of manufacturers granted use of the order.

The order is designed to relieve an acute shortage of machinery for underground and open-cut mining operations and for the preparation of coal and metallic ores for shipment.

It is applicable to equipment and material entering directly or indirectly, at any stage, into the construction of mining machinery by the producers granted the rating. Its extension to sub-contractors does not cover machinery or equipment used by these sub-contractors in their own manufacturing processes.

This order largely carries out an urgent request that general or blanket priority treatment be provided for the mining industry. Mining of coal and metals in effect is thus classified as a defense industry, with a rating of A-3 on machinery and equipment. To reduce the problems of administration and enforcement the rating is accorded to manufacturers rather than to mining companies.

The order was issued to manufacturers selected by the OPM on the basis of general knowledge that they are large and important manufacturers of mining machinery and equipment. It is understood that other manufacturers may make application for the same type of priority treatment and may receive the necessary authorization.

This order is in addition to other priority procedures, which may still be availed of where better suited to particular problems. The new order should do much to solve a problem which has been becoming constantly more acute, and to permit continued and increased production of minerals fundamental to our defense effort.

"The Gardner-Denver GD-9 loader has speeded up our rate of driving over 50%, without additional labor."

•

"Our new loader cleans up in two hours or less, a 5- to 5½-foot round, where formerly hand labor mucked out only one 4-foot round per shift."

•

"Our GD-9 loads out from 90 to 115, 2¾-ton cars in 7 to 7½ hours."

Saying it with **TONNAGE!**

Greater tonnage—not just words—proves the superior mucking performance of Gardner-Denver Mine Car Loaders.

They're equipped with two five-cylinder radial-air motors, powerful enough to crowd into the muck pile and come up with a full dipper every time. The lever-action of the exclusive Gardner-Denver rocker is designed for greater "crowding action" in filling the dipper—for accelerating lift and discharge of the load.

Learn how Gardner-Denver GD-9 Mine Car Loaders are speeding up ore production. For complete specifications write Gardner-Denver Company, Quincy, Illinois.

GARDNER-DENVER
Since 1859

Tuffy
Mining Machine Ropes

Last Longer
In all the various machines of modern mining, no matter how gruelling the punishment, Tuffy Can Take It.

Are Safer
Safety was *designed into* these superior wire ropes to reduce accidents.

More Economical
Because they last longer, replacements are less frequent.

Write For Information T-C

UNION WIRE ROPE CORPORATION
2144 Manchester Ave. Kansas City, Mo.
Tulsa • Houston • Chicago • Salt Lake City
New Orleans • Monahans • Portland • Ashland, Ky.

UNION Wire Ropes
The "ULTIMATE LOW COST WIRE ROPE"

SECTIONALIZE and ECONOMIZE
Automatic Reclosing CIRCUIT BREAKERS Produce Definite Economies

I-T-E

Raise production; reduce fire hazard; lower maintenance charges; decrease total energy consumption and power demand. Write for a copy of "D-C Circuit Breakers, Switchgear and Protective Relays for Mining Applications", Catalog 2502.

Type KSC Automatic Reclosing Circuit Breaker protecting one active mining area in a mechanized mine.

Representatives in Principal Mining Areas

I-T-E CIRCUIT BREAKER CO.
PHILADELPHIA, PA.

With the COAL DIVISION

of the AMERICAN MINING CONGRESS

STEEL AND TIMBER ROOF SUPPORTS FOR MINE ENTRIES

● *Submitted to the Committee on Roof Action by A. R. Joyce*

THIS report, which is a part of a study being conducted by the Committee on Roof Action, has been prepared in recognition of the fact that, as a matter of true economy, mine roof supports should, at their installation, be of sufficient size and lasting quality to serve the entry during its working life. The committee realizes that the actual roof weight is seldom known and it is therefore suggested, in using the tables given here, that the previous timbering be taken as the yardstick from which other materials of equal strength can be determined and compared.

The tabulations which follow have been arranged to show in groups, the shapes and sections of steel and wood beams that will have a supporting strength of not less than the uniformly distributed load shown in the tables. The timber sizes are figured cut to full dimensions, and the steel sections and shapes are those customarily available. Occasionally the sections shown are fully stressed; usually, however, the sections will actually support a weight in excess of the number of pounds given, but below the load figure of the next higher group.

Permissible loads on steel sections used as columns and on wood columns and wood cap pieces are shown in separate tables.

Steel handbooks and wood handbooks are available containing data and tables enabling the engineer accurately to figure stresses on beams and columns. It is not the purpose of this report to duplicate the existing material but, rather, to arrange the data for the mine operator in more convenient form.

The sizes of wood and steel cross bars to support uniformly distributed loads, increasing from 2,500 to 35,000 pounds by increments of 2,500 pounds, have been tabulated to guide the practical miner in selecting sizes of beams of approximate equivalent capacity from these two materials. The beam sizes were computed for the loads uniformly distributed, since this loading furnishes a convenient and accurate means of determining sizes in the two materials.

Working Stresses

Grades for sawed timber and pertinent working stresses are published by the U. S. Forest Service and technical associations. In the absence of grades for round timbers, stresses were formerly selected arbitrarily. Table 1 shows the size of knot which may occur in round timbers from 6 to 15 ins. in diameter having, respectively, 84 and 80 percent of the strength of clear wood. Knots of the tabulated sizes must, of course, occur in the most stressed portion of the stick—in this case the center third—to reduce the clear wood strength to the percentage shown. Moreover, a knot must occur on the bottom face of the beam as placed. For other positions the same sizes of knot would have less influence.

TABLE I—SIZES KNOTS PERMITTED IN ROUND TIMBERS FOR PER CENT GRADES

Knots to be measured on the circumference of the timber.

Diameter of Timber	Diameter of Knot 84% Grade	Diameter of Knot 80% Grade
Inches	Inches	Inches
6	2	2½
7	2⅛	2¾
8	2¼	2⅞
9	2⅜	3
10	2½	3¼
11	2⅝	3½
12	2¾	3⅝
13	2⅞	3¾
14	3	3¾
15	3⅛	3⅞

Clear wood values for extreme fibre in bending:
Southern pine and Douglas fir without density or close grain requirements—2,000 lbs.
Oak—red and white—1,866 lbs.
For 84% grade f=
Pine and Douglas fir=1,700 lbs. per square inch.
Oak=1,586 lbs. per square inch.
For 80% grade f=
Pine and Douglas fir=1,600 lbs. per square inch.
Oak=1,493 lbs. per square inch.

The working stresses for the timber cross bar sizes are derived from basic working stresses published by the U. S. Forest Products Laboratory and tabulated on page 105 of the "Wood Handbook."* The stresses used in computing Table 2 are for a grade of timber having 80 percent the strength of clear wood and are, therefore, conservative. Southern Pine and Douglas Fir, even without density or close ring growth, are stronger than Oak. As shown by the stress figures at the bottom of Table 1, "f", the permissible stress in extreme fibre in bending, is approximately 100 lbs. per sq. in. greater for Southern Pine and Douglas Fir than for the same grade of Oak. In this report, however, the three species are considered to have the same strength in bending and the lower value, "f," than for Oak, is used in making the computations for Table 2.

Rectangular Timber Beams.—For computing the strength of timber beams of rectangular section "f," the permissible stress in extreme fibre in bending, has been taken as 1,500 lbs.

* Superintendent of Documents, Washington, D. C.

TABLE 2-A

SIZES WOOD AND STEEL BEAMS REQUIRED TO SUPPORT VARIOUS LOADS

For 8-Foot Span

Load Lbs.	Steel Beam Size and Weight	Treated Timber Round Diameter	Sawed Dimensions On Edge	Flat
2,500	4x4 @ 7.5 7x2—⅛ @ 5.5 40 lb. rail	5½″	4x6	
5,000	6x4 @ 8.5 4x4 @ 10 55 lb. rail	7″	6x8	8x6
7,500	4x4 @ 13.8 4x4 @ 13 8x4 @ 10 75 lb. rail	8″	6x8	10x6
10,000	6x4 @ 12 8x4 @ 10 80 lb. rail	9″	8x8	8x8
12,500	8x4 @ 13 6x4 @ 16 10x4 @ 11.5 90 lb. rail	9½″	6x10	10x8
15,000	10x4 @ 11.5 8x4 @ 15 6x6 @ 15.5 100 lb. rail	10″	8x10	12x8
17,500	12x4 @ 14 10x4 @ 15 6x6 @ 18	11″	6x12	10x10
20,000	12x4 @ 14 10x4 @ 17 6x6 @ 20	11½″	10x10	
22,500	12x4 @ 16.5 10x4 @ 17 6x6 @ 22.5 8x5¼ @ 17	11½″	8x12	
25,000	12x4 @ 16.5 10x4 @ 19 8x5¼ @ 19 6x6 @ 25	12″	10x12	12x10
27,500	12x4 @ 19 8x5¼ @ 19 6x6 @ 25	12½″	10x12	
30,000	10x5¾ @ 21 8x6½ @ 24 6x6 @ 30	13″	12x12	
32,500	10x5¾ @ 21 8x6½ @ 24 6x6 @ 30	13″	12x12	
35,000	10x5¾ @ 21 8x6½ @ 24	13½″	12x12	

TABLE 2-B

SIZES WOOD AND STEEL BEAMS REQUIRED TO SUPPORT VARIOUS LOADS

For 10-Foot Span

Load Lbs.	Steel Beam Size and Weight	Treated Timber Round Diameter	Sawed Dimensions On Edge	Flat
2,500	4x4 @ 7.5 45 lb. rail	.... 6″	6x6 4x8	6x6 7x5
5,000	6x4 @ 8.5 4x4 @ 13.8 4x4 @ 13 70 lb. rail	7½″	6x8	
7,500	8x4 @ 10 6x6 @ 15.5 85 lb. rail	9″	8x8	8x8
10,000	8x4 @ 13 6x6 @ 15.5 5x5 @ 18.9 100 lb. rail	9½″	8x10	10x8
12,500	12x4 @ 14 10x4 @ 15 6x6 @ 15.5	10½″	8x10	12x8
15,000	12x4 @ 14 10x4 @ 17 6x6 @ 20	11″	10x10	
17,500	12x4 @ 16.5 6x6 @ 23 8x5¼ @ 19	11½″	8x12	12x10
20,000	12x4 @ 19 8x5¼ @ 21 6x6 @ 27.5 6x6 @ 27	12″	10x12	12x10
22,500	10x5¾ @ 21 6x6 @ 30 8x6½ @ 24	12½″	10x12	
25,000	10x5¾ @ 21 8x6½ @ 24 6x6 @ 30	13″	12x12	
27,500	10x5¾ @ 23 8x6½ @ 27	.... 13½″	10x14 12x12	 12x12
30,000	12x6½ @ 25 8x8 @ 31 8x8 @ 32.6	14″	12x14	14x12
32,500	12x6½ @ 25 8x8 @ 31 8x8 @ 32.6	14½″	12x14	14x12
35,000	12x6½ @ 25 8x8 @ 31 8x8 @ 32.6	14½″	12x14	

per sq. in. and this value substituted in the basic equation

$$M = f\frac{1}{y}$$

in which

M = resisting moment
f = permissible stress in extreme fibre in bending
1 = moment of inertia
y = distance from the neutral axis to the extreme fibre

Round Timber Beams.—To make the formula applicable to beams of circular cross section, this value of "f" must be multiplied by the factor of 1.18 as recommended by the U. S. Forest Products Laboratory, page 155 of the "Wood Handbook." A value of f = 1,500 x 1.18, or 1,770 lbs. per sq. in. was, therefore, substituted in the formula for determining the round timber sizes.

The round timber beam sizes shown in Table 2 are small end diameters. Actually, round timbers, because of natural taper, have a larger and consequently more efficient beam section at the critical point than at the small end. The round sections, therefore, computed on the basis of small end diameters, have a somewhat high factor of safety.

No reduction of stress is made because of exposure. Treated timber, since it remains sound, retains its original strength and cross section, even under severe conditions of exposure, when the treating processes, preservatives, and retentions conform to the specifications of the American Wood Preservers' Association.

Lateral Support.—All beams must be deemed laterally unsupported throughout the span length, as the lagging cannot be depended on for effective restraint. The proportion of width to depth is such, for all timber beams shown in the table, that no reduction of stress is required for lack of lateral support. The Forest Products Laboratory states that no stress reduction is necessary in timber beams until the depth exceeds twice the width, and this height to depth ratio is not exceeded in any of the timber beams in Table 2.

Longitudinal Shear.—Shear stresses

TABLE 2-C

SIZES WOOD AND STEEL BEAMS REQUIRED TO SUPPORT VARIOUS LOADS

For 12-Foot Span

Load Lbs.	Steel Beam Size and Weight	Treated Timber Round Diameter	Sawed Dimensions On Edge	Flat
2,500	4x4 @ 10 6x4 @ 8.5 55 lb. rail	..... 6½"	4x8	6x6
5,000	6x4 @ 12 8x4 @ 10 80 lb. rail	..... 8"	6x8	10x6
7,500	6x4 @ 16 10x4 @ 11.5 100 lb. rail	..... 9½"	6x10	10x8
10,000	6x6 @ 18 12x4 @ 14 10x4 @ 15	..... 10"	8x10	12x8
12,500	12x4 @ 16.5 10x4 @ 19 6x6 @ 20	.... 11"	10x10	
15,000	12x4 @ 19 10x5¾ @ 21 6x6 @ 25	..... 11½"	8x12	12x10
17,500	10x5¾ @ 21 6x6 @ 30	..... 12½"	10x12	
20,000	10x5¾ @ 23 8x6½ @ 24	..... 13"	10x12	
22,500	10x5¾ @ 23 8x6½ @ 27	..... 13½"	12x12	
25,000	12x6½ @ 25 8x8 @ 31	..... 14"	10x14	14x12
27,500	12x6½ @ 25 8x8 @ 31	..... 14½"	10x14	14x12
30,000	12x6½ @ 25 8x8 @ 31	..... 14½"	12x14	
32,500	12x6½ @ 28 8x8 @ 34.3	..... 15"	12x14	
35,000	12x6½ @ 28 10x8 @ 33 8x8 @ 40	..... 15½"	14x14	

TABLE 2-D

SIZES WOOD AND STEEL BEAMS REQUIRED TO SUPPORT VARIOUS LOADS

For 14-Foot Span

Load Lbs.	Steel Beam Size and Weight	Treated Timber Round Diameter	Sawed Dimensions On Edge	Flat
2,500	6x4 @ 8.5 65 lb. rail 10x4 @ 11.5	..... 7"	4x8	6x6
5,000	6x4 @ 16 6x6 @ 15.5 90 lb. rail 5x5 @ 18.9	..... 8½"	8x8	
7,500	10x4 @ 15 6x6 @ 15.5	..... 10"	8x10	10x8
10,000	10x4 @ 19 12x4 @ 16.5 6x6 @ 22.5 8x5¼ @ 19	..... 11"	10x10	
12,500	10x5¾ @ 21 8x5¼ @ 21 6x6 @ 27	..... 11½"	8x12	12x10
15,000	10x5¾ @ 21 8x6½ @ 24	..... 12½"	10x12	
17,500	10x5¾ @ 23 8x6½ @ 27	..... 13"	12x12	
20,000	12x6½ @ 25 10x5¾ @ 26 8x8 @ 31	..... 13½"	12x12	
22,500	12x6½ @ 25 10x5¾ @ 29 8x8 @ 31	..... 14"	10x14	14x12
25,000	12x6½ @ 28 8x8 @ 33	..... 14½"	12x14	
27,500	12x6½ @ 28 8x8 @ 40 10x8 @ 33	..... 15"	12x14	
30,000	12x6½ @ 32 8x8 @ 40	..... 15½"	14x14	
32,500	12x6½ @ 36 10x8 @ 37 8x8 @ 48	..... 16"	14x14	
35,000	12x6½ @ 36 10x8 @ 37 8x8 @ 48	..... 16½"	12x16	16x14

have been kept within safe limitations. Beams, the strength of which might be limited by shear rather than by bending stress, have been checked by methods prescribed in the "Wood Handbook." On the 8-ft. span, one or two rectangular sections designated for the larger maximum loads developed longitudinal shear slightly in excess of 125 lbs. per sq. in. The overrun, however, is negligible. Moreover, working stresses are for the weakest timber of a grade and the average timber, because of lesser defects, is stronger. For span lengths greater than 8 ft., bending and not shear stresses govern. Round timber sections are not highly stressed in shear even on the 8-ft. spans. These sections have an advantage over the sawed or rectangular sections in that maximum unit shears developed along the neutral plane are only 4/3 the average unit shear instead of 3/2 as in the case of rectangular sections.

Deflection.—The deflection that would occur in any of the beams tabulated in Table 2 under maximum load is not excessive and would not in any way impair the strength of the cross bar. The deflection occurring under maximum load would not be greater than would be expected from many bridge stringers or beams of other structures when carrying the loads for which they were designed. Since the stiffness of the circular section increases as the fourth power of its diameter, the enlarged section provided at the critical point by taper would insure considerably less deflection than is estimated from the small end diameter.

Steel Beams.—In computing structural steel beam sizes, a stress of 20,000 lbs. per sq. in. was used where the unsupported span length did not exceed 15 times the flange width as recommended by the American Institute of Steel Construction in their manual, "Steel Construction." Where the unsupported span length is more than 15 times the flange width, stresses were reduced in accordance with the formula recommended in the above manual—namely:

$$F = \frac{22{,}500}{1 + \frac{l^2}{1{,}800\ b^2}}$$

Where F = the permissible stress on the compression flange in lbs. per sq. in.
l = the length of the laterally unsupported flange in ins.
b = width of beam flange in ins.

Rail Sections.—An extreme fibre stress of 12,000 lbs. per sq. in. was assumed for the rail sections. Rails

used for cross bars are usually from second-hand stock on which there may have been considerable wear. The section moduli of new sections, however, were used with the 12,000-lb. stress in computing the rail sizes. Stress was reduced for unbraced spans by the same percentage that the basic stress for rolled shapes was reduced for similar ratios of $\frac{l}{b}$. The base width, instead of the ball width of the rail, however, was used in computing the $\frac{l}{b}$ ratios. Had the ball width been used, stress reductions would have been greater and somewhat larger sections required.

Strength of Other Timber Sizes.—When sizes of timber not shown in the table are to be used because they are in stock or for other reasons, maximum uniformly distributed safe loads can be estimated by comparing the stock sizes with timbers tabulated for the same span length, since the strength of rectangular timbers varies as the product of the width and the square of the depth. Thus, comparing an 8 x 10-in. with a 6 x 8-in. timber over the same span, the 8 x 10-in. is

$$\frac{8 \times 10^2}{6 \times 8^2} = \frac{8 \times 100}{6 \times 64} = 2.08$$

or 2.08 times as strong.

In the case of round timbers the strength varies as the cubes of the respective diameters.

For the grade of material considered in this report the following simple formulas provide a ready means of calculating the maximum load:
For rectangular beams—

$$W = \frac{500 d^2 b}{3 l} = \frac{166.7\ d^2 b}{l}$$

For circular beams—

$$W = \frac{115.8 d^3}{l}$$

Where

W = Maximum safe load in pounds uniformly distributed
D = Depth of rectangular or diameter of circular beam in inches
B = Breadth of rectangular beam in inches
L = Span length in feet.

TABLE 3

PERMISSIBLE LOADS ROUND TIMBER COLUMNS TREATED
Working Stress Compression Parallel to Grain=800 Lbs.

Diameter In.	Area Sq. In.	Length of Column in Feet 5 Stress	5 Load Lbs.	6 Stress	6 Load Lbs.	7 Stress	7 Load Lbs.	8 Stress	8 Load Lbs.	9 Stress	9 Load Lbs.
4	12.5	760	9,500	710	8,875	655	8,200	...	.....	...	.....
5	19.6	780	15,200	760	14,800	745	14,600	695	13,600	...	.....
6	28.2	790	22,000	780	21,700	767	21,600	745	21,000	710	20,000
7	38.5	800	30,800	790	30,400	780	30,000	767	29,600	750	28,900
8	50.3	800	40,300	800	40,300	790	39,800	780	39,200	767	38,600
9	63.6	800	50,750	800	50,750	...	.....	790	50,250	780	49,500
10	78.5	800	62,500	800	62,500	...	.....	800	62,600	783	61,500

NOTE: The strength of square timber columns can be taken as the same as that of round columns of the same cross sectional area.

Columns or Legs

The legs supporting the ends of cross bars act as columns and should be strong enough to support the beam reactions induced by capacity loads on the cross bars. Since loads caused by roof breaks may impose greater reactions at one end of the beam than at the other, the leg should have a capacity as a column somewhat in excess of one-half the breaking load. However, any great increase in strength over that required to support the cross bar under maximum permissible load is unnecessary and wastes material without appreciably increasing the strength of the set, since the frame cannot be stronger than its weakest member.

TABLE 4

COLUMN LOADS DETERMINED FROM ALLOWABLE BEARING STRESS ON OAK CAP
Working Stress (Perpendicular to Grain) =500 Lbs. Sq. In.

Diameter Inches	Area Sq. In.	Stress Lbs. Sq. In.	Allowable Load Lbs.
4	12.5	500	6,250
5	19.6	500	9,800
6	28.2	500	14,100
7	38.5	500	19,250
8	50.3	500	25,150
9	63.6	500	31,800
10	78.5	500	39,250

TABLE 5

ALLOWABLE LOADS ON STEEL SECTIONS USED AS COLUMNS

Size—Weight	Length of Column—Feet 5	6	7	8	9
4"x4" @ 7.5	33,000	31,000	29,000	27,000	24,000
4"x4" @ 10	44,400	42,000	39,000	36,000	32,000
4"x4" @ 13	58,250	55,000	52,000	48,000	43,000
4"x4" @ 13.8	60,200	57,000	53,000	48,000	43,000
5"x5" @ 18.9	86,000	61,000	59,000	56,000	53,000

Formulas for the computation of columns or tables of permissible column loads have little value in indicating the strength of mine timber sets, since foundations or bearings for the cross bars, adequate to carry the load which the post will safely support as a column, are seldom provided.

For example, Table 3 shows the allowable loads on round timber columns with mean diameters of 4 to 12 in. In computing this table the value of 800 lb. for compression parellel to the grain has been used. This is conservative for a common grade of oak and somewhat low for pine. In Table 4 the allowable loads based on the bearing area provided by the several diameters under an oak cross bar or cap are shown. In all cases these are less than corresponding values in Table 3, where the loads are determined from column formulas.

Again, a 4 x 4-in. steel H-beam weighing 13.8 lb. per ft. and 6 ft. long will support a load of 57,000 lbs. without exceeding conservative working stresses. To develop this capacity, the load at its base must be distributed by a bearing plate or other suitable column base over an area of 95 sq. in. on a footing with a permissible bearing value of 600 lb. sq. in.

The capacity of the leg, therefore, depends on factors to which its strength as a column bears little or no relation. In general, any leg with sufficient cross section to permit suitable framing or connections will be adequate as a column to support the allowable loads on the cross bars.

Approved July, 1941, by the
Subcommittee on Roof
Support Materials
A. R. Joyce, Chairman.
E. H. Heald.
E. R. Maize.
F. G. Smith.

WHEELS of Government

● *As Viewed by A. W. Dickinson of the American Mining Congress*

THERE is no letup, on the contrary there is increased activity in the national defense program during these intense—and hot summer days. The occupation of Iceland by our Navy, consideration of the serious situation in South America, the violence of the Russian phase of the war, and the grave situation with Japan all trend toward the stimulation of our enormous preparedness efforts. More and more the country is being made war-conscious by Federal appeals for the collection of aluminum from every kitchen, crossroads and hamlet, and now by gasless nights for the 25,000,000 owners of automobiles. The present strength of our Army is above one and one-half million men, drawn from every community in the land, and interest of nearly every family will soon be centering on the war maneuvers in Louisiana, North Carolina and other southern states—slated to be the greatest ever held in the western hemisphere. Ever increasing is the call of the defense agencies for greater production of minerals and other raw materials needed to fill the requirements of production in the growing plants and factories and in the new and expanding facilities erected at the urgent request of the defense leaders.

Washington Highlights

PRIORITIES: Mining equipment manufacturers get A-3 Preference Rating for defense needs.

TAXES: Excess Profits exemption to producers of strategic metals stricken out in committee. May be restored.

IMPORT DUTIES: Bill would suspend import taxes or duties on defense articles.

ST. LAWRENCE PROJECT: Hearings continue. Industry and labor unite in opposition.

PUBLIC LANDS: Ickes urges extension of leasing system for mineral lands. Opposed by mining industry.

EXCESS PROFITS TAX: House rejects White House request for invested capital base only.

PROPERTY SEIZURE: Bill giving President power to take over needed materials moves toward enactment.

PLANT SEIZURE: Modified bill considered to permit President to operate strikebound defense plants.

Mines Can Now Secure Equipment

The growing shortage of machinery and equipment for coal and metal mining operations has been eased to a gratifying extent by the issuance on July 29 of preference rating order P-23 by the Division of Priorities of the Office of Production Management. Resulting from several months of persistent representations by the American Mining Congress, this order grants a preference rating of A-3 to manufacturers producing machinery and equipment directly necessary for underground and open-cut production of (a) coal, and (b) any materials produced with a view to extracting their metallic content; and machinery and equipment for all customary processes necessary for beneficiation and preparation for shipment of the coal and materials thus specified.

It should be particularly noted that to permit administration the preference rating is accorded to the manufacturers of mining machinery and equipment; thus, the word "producer" applies to the manufacturer, who may make use of the order for the purpose of purchasing materials on the Priorities Critical List. Mining companies will not use the preference rating directly; but the manufacturers who receive the necessary authorization under the order may apply the A-3 rating to their purchases of materials, thus enabling them to fill orders from mining companies at the earliest practicable date. The OPM preference rating order which will enable manufacturers of mine locomotives to secure necessary materials has also been issued, and the repair and maintenance order for materials and equipment required for uninterrupted operation of mining and certain other industries is anticipated shortly. It is understood that the delay in issuing the repair and maintenance order is occasioned by the lack of provision for an administrative staff to handle the volume of work which is expected to follow its promulgation.

This combination of preference ratings places the mining industry and the manufacturers of its equipment in a position to carry on with a minimum of difficulty under the defense program, and the OPM officials are to be congratulated upon their helpfulness and foresight.

AMC's Position on Tariff Bill

The Doughton-Johnson War Department Bill which would suspend import taxes or duties upon the im-

portation of any article certified by a department or agency of the United States to be a "defense article" is understood to be the next matter for consideration by the House Committee on Ways and Means after the disposal of this present revenue bill. Consideration of this measure may be delayed somewhat by a series of three-day recesses proposed for House members during the last half of August.

The American Mining Congress has urged both the Committee on Ways and Means of the House and members of the Senate (1) that the bill be amended to provide a definite termination date, following which the protection of existing duties will automatically be restored; (2) that the power to certify articles as defense materials, on which the tariff would be waived, be given to only one agency of the Government, which agency should be directly concerned with defense production; (3) that goods imported under the provisions of the act be used exclusively for defense purposes; and (4) that section 5 of the bill, repealing all laws which are inconsistent or in conflict, be amended to provide that such laws or parts thereof be merely suspended during the life of this bill.

House Struggles With Taxes

Finally reporting the revenue bill of 1941 on July 25, the Committee on Ways and Means sought and secured a closed rule permitting only committee amendments on the floor of the House, and debate began on the bill on July 29. A motion by Representative Buck, of California, was approved, however, to take a separate floor vote on the inclusion of the provision compelling joint income return by husband and wife. This issue had been fought out in committee and only remained in the bill by a very close vote.

Another hotly contested issue in the committee arose over the requests of the Treasury and the Administration that the average earnings method of determining the excess profits tax credit be eliminated. It is understood that the committee was quite resentful of this last-minute pressure because it had previously turned down the Treasury on the same point, and the final vote was 20 to 5.

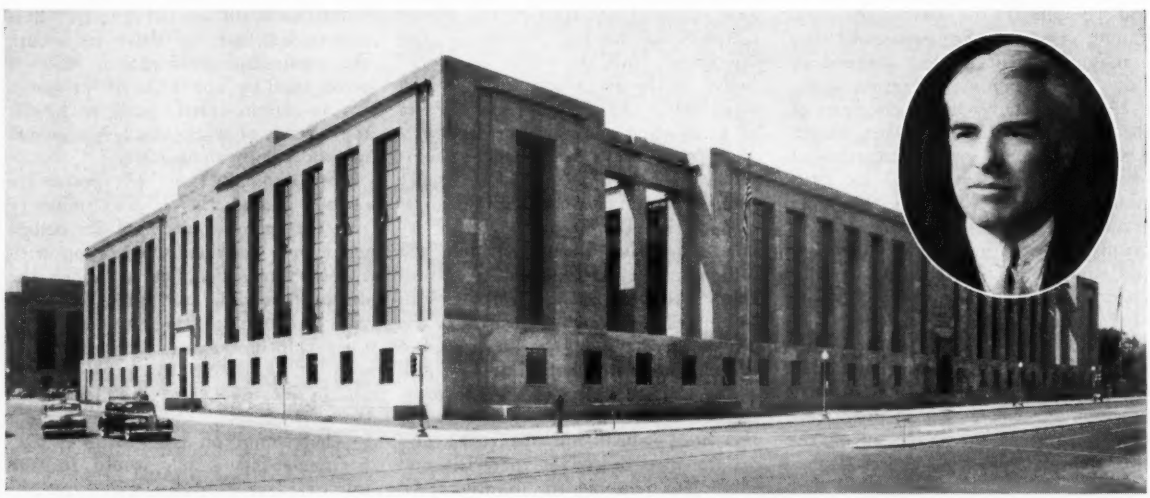
The bill as it goes to the Senate contains the higher excess profits tax rates and also the special 10 percent rate applying to corporations using the invested capital method whose earnings in the base period were less than 8 percent, and who must pay this rate on any additional earning up to the 8 percent and 7 percent allowances. The excess profits tax must be computed on net earnings before deduction of normal tax, and the normal tax of 24 percent and surtax of 6 percent are then applied to the income after deducting the excess profits tax; this reverses present procedure under which the normal tax is deducted before computing excess profits tax. As an inducement for new capital invested, a corporation making return under the invested capital method will be allowed to compute newly invested capital at the rate of 125 percent of the actual investment.

The bill contains an increase in the capital stock tax from $1.10 to $1.25 per thousand of declared value. It is well to remember that this capital stock tax applies to current returns and the Commissioner has granted an additional 60 days for filing. It is also important to note that the new declaration of value made at this time may not, as the law stands, be again revised until 1944. When the 1938 revenue act was passed provision was made for redeclaration in 1938, with the right to increase such declared value in 1939 and 1940, but no such right to increase the declared value has been granted for 1942 and 1943.

Of serious harm to the defense program was the committee's last-minute action in eliminating the exemption from the excess profits tax for the producers of tungsten, quicksilver, manganese, platinum, antimony, chromite, and tin. It is sincerely to be hoped that the Senate will restore the exemption which stands in the law at the present time, as various enterprises now being developed for the production of these metals are considering the suspension of operation; as a result the country will not only lose badly needed supplies of strategic minerals but the local communities will lose pay rolls and the local, State and Federal Governments will lose substantial tax revenue.

The vacant chairmanship of the Senate Committee on Finance has been filed by Senator George, of Georgia, as successor to the late Senator Pat Harrison, of Mississippi. Senator Tom Connally, of Texas, has succeeded Senator George as chairman of the Committee on Foreign Relations but

Social Security Building, Washington, D. C.; containing offices of the OPM. Inset, E. R. Stettinius, Jr., Director of Priorities



still retains his membership on the Finance Committee. Senator William H. Smathers, a Democrat of New Jersey, has been chosen to fill the place made vacant on the Finance Committee.

St. Lawrence Project Nears Committee Vote

Hearings on the St. Lawrence Waterway and Power Project are drawing to a close and in the next week or two the House Committee on Rivers and Harbors will vote on reporting the bill to the House. After a trip to the International Rapids Section of the St. Lawrence River the committee resumed its hearings on July 24, at which time Secretary Julian D. Conover, of the American Mining Congress, first witness for the mining industry, presented a vigorous protest. After reviewing the power aspects of the project, he charged that the chief significance of the St. Lawrence Seaway would be as an inlet to the heart of America for the products of cheap foreign labor, rather than as an outlet for American products, and cited the great iron ore industry of the Lake Superior Region as an example of those to be adversely affected by the seaway. He pointed out the loss of markets which the coal industry would suffer, both directly from the importation of foreign coal and fuel oil into our Canadian and interior markets and indirectly through diversion of traffic from our efficient railway system and decreased industrial activity resulting from imports of iron ore, iron and steel, and other products. Mr. Conover's statement appears elsewhere in this issue.

For the bituminous coal industry appeared John D. Battle, of the National Coal Association; R. L. Ireland, Jr., president of the Hanna Coal Company; R. E. Howe, president, Appalachian Coals, Inc.; Jesse V. Sullivan, for the West Virginia Coal Association; W. A. Jones, for the Pennsylvania Coal Producers Association; and Walter S. Schulten, for the Western Pennsylvania Coal Operators Association. President John L. Lewis, of the United Mine Workers of America, registered his unqualified opposition in a vigorous statement.

A clear picture of the Lake Superior iron ore industry, lake shipping and the disastrous effects upon them of the waterway was presented by Alexander C. Brown, vice president, Cleveland Cliffs Iron Company. Louis C. Madeira, 3rd, for the Anthracite Institute; Secretary Thomas Kennedy, of the U. M. W. A.; and Congressman Flannery, of Pennsylvania, voiced the united opposition of the anthracite region.

Another Raid on the Prospector

A Senate Public Land Subcommittee has recently conducted hearings on conservation and utilization of resources on the public lands of the United States. Senator O'Mahoney, of Wyoming, is chairman of the subcommittee, and Senators Alva Adams, of Colorado, and John Thomas, of Idaho, are the other members. Interior Secretary Ickes and a number of his bureau chiefs testified, the testimony of the Secretary being of particular interest to mining men. He recommended large increased appropriations for the Bureau of Mines and Geological Survey to explore, and to develop information concerning, mineral resources on the public domain. The Secretary also took occasion, however, repeatedly to urge that the present law providing for discovery, location and patent of mineral claims be amended, so as to "broaden the coverage of the mineral leasing principle as opposed to the system of lode and placer claims."

It was not the purpose of Senator O'Mahoney or of Senators Adams and Thomas in assisting in the development of the natural resources of the West, to tamper in any way with the present mining laws, but the testimony presented before the subcommittee gave ample proof that there exists, in the present Administration staff, a desire to take away from the men who prospect and develop mining properties the age-old rights to have and to hold title as the reward of their enterprise.

Donald A. Callahan, vice president of the American Mining Congress, of Wallace, Idaho, appeared before the subcommittee and, in refuting the testimony given by the Secretary of Interior, said in part: "Under these laws we have witnessed an example of private initiative which is perhaps unequaled in the annals of mankind. The mountains of the western country have been made to give up their treasures and those treasures have been placed at the disposal of mankind to make possible the great advance in industrial development and efficiency which we know as 'the machine age.' The incentive was, of course, the lure of profits to those fortunate enough to discover bonanza veins. We do not believe that the development of the forbidding country lying west of the Rocky Mountains would have been possible under any other system. Mining on the North American Continent has always represented the highest type of American enterprise and that enterprise is the vital principle underlying the accomplishment and the character of the American people. The prospector has tramped the hills and carried his blankets and lain down under the stars at night alone. He has searched the surface of the earth for indications of treasure beneath. He has studied the rocks and followed his own judgment in locating his claims. Upon those claims he has expended his own energies, has used his own intelligence, and has reaped for himself personally either reward, sometimes in large measure, or has become a human sacrifice to the inexorable progress of the human race."

In closing Mr. Callahan said: "Local, State and Federal Governments have taken their share in the form of taxes and now are taking an increased share of the return from these enterprises. And there is one thing which we must remember with regard to the profits of mining. Nobody has lost. Everybody has gained. New wealth has been added. Increased comforts have been procured for the human race. So I submit to you that the laws relating to the location, appropriation and operation of mining claims have worked. They should not be disturbed. The system should not be distorted."

Alaska Coal Company Expanding

In order to keep up with increasing demands for fuel in the markets of Anchorage, Alaska, and to be in readiness to meet delivery requirements of a contract to supply the Army with 40,000 tons of coal annually at Fort Richardson, the Evan Jones Coal Company of Alaska has embarked upon an expansion program at its Jonesville mine camp, which is expected to step up production at least 25 percent.

The company is planning to construct a new washery as soon as the necessary equipment and materials arrive from the States, and new camp buildings are already under construction to accommodate the anticipated increase in mine workers. Average employment at the mines at the present time is about 50 men. When the new washery equipment arrives, mine operations will be suspended until the machinery is installed. The company has purchased new automatic steel mine cars and is making other mine improvements to take care of the increased demand.

Getting Ready for the San Francisco Convention

IN THESE strenuous times and with the keynote, "Metals for Defense," the Eighth Annual Metal Mining Convention and Exposition of the American Mining Congress will have greater significance than ever before.

The advance outline of the program, given here, for the Metal Mining Convention and Exposition of the American Mining Congress, Western Division, at San Francisco, from Monday, September 29 to Thursday, October 2, inclusive, indicates the importance and magnitude of the problems faced today by the mining industry. These problems are increasing as mining's defense production grows. The subjects will be treated by authoritative speakers, with full opportunity given for discussion from the floor.

Now is the time for mining men everywhere to lay their plans to be in San Francisco the week of September 29, to take collective action and arrive at definite conclusions regarding these many perplexing matters. Plan to be there.

In addition to the program devoted to economic and operating subjects. there will be a notable display of machinery and supplies, covering all the material and equipment needs of the industry. Manufacturers are busy preparing educational exhibits to inform operating men of new and improved means of increasing production and lowering cost. A series of first-class entertainment features is being arranged to provide amusement and recreation during the evening hours, with special day-time features for the ladies. Inspection trips will be made to some of the many historic and interesting mining fields of California. In addition, for recreation and pleasure, there are the many golf courses, beaches and other sport and vacation facilities for which the San Francisco bay region is noted.

Program Shaping Up

Under the able chairmanship of James W. Wade, and with the hearty cooperation of state and district chairmen and committee members from each of the major mining states and districts of the country, subjects for the sessions have been selected of prime importance to mining men today. With the rapid changes in the defense picture as it affects mining, completion of certain parts of the program is being deferred in order that it may be keyed to the actual situation at the time of the meeting.

Among the important speakers thus far included in the convention program is Albert W. Hawkes, president of Congoleum-Nairn Corporation and president of the U. S. Chamber of Commerce, who will address the meeting on "Labor Relations and Defense

JAMES W. WADE
National Chairman, Program Committee

Production." James K. Richardson, safety director, Climax Molybdenum Company will have a paper on "Accident Prevention in the Present Emergency." L. K. Requa, president and general manager, Idaho-Almaden Mines Company, Weiser, Idaho, is making arrangements for and heading a panel for a full-session symposium on "Geology and Ore Discovery." This will develop further the discussion started by Ira B. Joralemon and Reno Sales at last year's meeting, which has attracted such widespread interest. Ivan Bloch, chief of the marketing division, Bonneville Power Administration, will present an address on "Western Power

W. C. BROWNING
Chairman, Western Division, American Mining Congress

Production and Mineral Development." Robert M. Searls, attorney-at-law of San Francisco, will discuss legislative and economic problems of "Stream Pollution." A session will be held on "Strategic Minerals—Where Are We?" in which the position of each of the major and strategic minerals will be given as to sources of supply, new developments in domestic production, and prospects for the future. The relation of new Federal and State taxes to the mining industry, and the effects of government policies on exploration and development will also be analyzed. The industry's viewpoint on current economic and legislative matters will be developed in a Declaration of Policy which will highlight mining's relation to national government and the defense program.

For the large number of those from the operating ranks including many younger men who will attend the meeting, special sessions on operating problems will be held, featuring papers on recent developments in operating practice and the application of mechanical equipment. The use of shaking conveyors in underground mines will be described by Robert W. Hughes, general superintendent, Miami Copper Company. Other papers on Belt Conveyors, Use of Slushers, and Under-

\+ + +

The attention of the entire metal mining industry is focused on the 1941 Convention program. Among the important subjects on which discussion will be led by authoritative speakers are:

MINING'S PROBLEMS IN THE DEFENSE PROGRAM
Production to Meet Unprecedented Demands... Price Control Policies...Priorities on Mining Equipment...Labor Supply Problems, etc.

STRATEGIC MINERALS
Foreign Sources...Procurement for Defense Needs ...Pressure for Domestic Production...Trade Agreement Policies...Tax Deterents to New Development.

THE R.F.C. AND DEFENSE METALS
Purchase of Foreign Metals...Government Financing of Increased Production.

WESTERN POWER PRODUCTION AND MINERAL DEVELOPMENT
Relation to Aluminum and Magnesium Production ...Other Minerals.

METALS TODAY—WHERE ARE WE?
Authoritative Reviews of the Present Status and Outlook for Iron Ore...Copper...Zinc...Lead... Manganese...Tungsten...Molybdenum...Chrome ...Mercury...Antimony...Gold...Silver...Potash and Borax.

ORE DISCOVERY—A SYMPOSIUM
Recent Ore Discoveries in the West and the Factors Responsible for Them...The Role of Geology and Geologists...Contributions of the Miner and Prospector...Accidental Discoveries...Planning of Future Exploration.

LABOR PROBLEMS
Labor Relations Today...Wage Hour Problems.

MINE TAXATION
New Federal Tax Laws...Effect of Excess Profits Tax on Mining...Need for Equitable Treatment of Special Problems.

MINE ACCIDENT PREVENTION
New Problems Under Present Capacity Operation.

STREAM POLLUTION
Status of Federal and State Action...Industry's Cooperation with Administrative Authorities.

EFFECT OF GOVERNMENT CONTROLS ON EXPLORATION FOR MINES
Tax Policies, Federal and State...Interference with Working Conditions and Labor Relations...Social Security Costs, etc....S.E.C. Restrictions...What These Mean to Ore Production of the Future.

OPERATING PROGRESS
Advances in Mining, Loading and Handling of Ore ...Use of Conveyors...Mechanical Loading...Improvements in Drilling Practice...New Equipment... Special Sessions for Operating Men on These and Related Subjects.

NEW DEVELOPMENTS IN MILLING PRACTICE
Review of Recent Progress...New Plants and Processes.

PLACER MINING
Advances in Dredge Operation and Maintenance ...Dragline Practice...Hydraulic Mining...A Special Session Devoted to These Subjects.

---

ground Loaders, and Drill Jumbos will be presented, as well as one on Hot Milling of Detachable Bits by Charles A. Kumke, mine superintendent, Golden Queen Mine. In a session devoted to milling practices a comprehensive review will be given of new developments and equipment, followed by a discussion of this subject. Blair Burwell, general superintendent, U. S. Vanadium Corporation will describe that company's new tungsten plant at Bishop, California.

Placer and hydraulic mining will come in for attention at one session at which will be presented a paper on the "Use of Small Bucket Line Dredges," which will be presented by Norman Cleaveland, manager, Roaring River Gold Dredging Company; one on "Dragline Methods of Equipment and Maintenance," by Harry S. Lord, Lord & Bishop; and "Problems in Present Day Hydraulic Mining," by well-known authorities in this field.

Local Arrangements

The arrangements committee, with P. R. Bradley as general chairman, and A. F. Knorp as vice chairman, are perfecting plans to assure smooth functioning of the program and of all social activities for the enjoyment of the convention-goers. Working with them are Errol MacBoyle as chairman of the entertainment committee; F. W. Nobs, chairman of the attendance committee; Charles H. Segerstrom, chairman of the publicity committee; F. C. van Deinse, chairman of the finance committee; H. W. Gould, chairman of the trips committee; W. S. Boyd, chairman of the reception committee, and Mrs. F. W. Bradley, chairman of the ladies entertainment committee.

Trips

On Friday and Saturday of convention week, opportunity will be given to inspect well-known mining enterprises and operations on the historic Mother Lode in the great placer mining centers and other points of interest within driving distance of the bay.

Exposition Complete

With virtually all exhibit space taken in the Fairmont Hotel and additional space on the pavement in front of the hotel, it is apparent that the display of mining equipment, machinery and supplies will be complete in every detail. Opportunity will be given to obtain up-to-the-minute knowledge on new developments and the latest application of time-proven equipment at all of the booths. A list

General view of exhibit floor at the 1940 Exposition

of the manufacturers who, to date, have contracted for exposition space is as follows:

Allen-Sherman-Hoff Co.
Alloy Steel & Metals Co.
American Brattice Cloth Corp.
American Pneumatic Tool Co.
Anaconda Wire & Cable Co.
Atlas Powder Co.
Bethlehem Steel Co.
Bucyrus-Erie Co.
E. D. Bullard Co.
C. S. Card Iron Works Co.
Chicago Pneumatic Tool Co.
Cleveland Rock Drill Co.
Dorr Co., Inc.
E. I. du Pont de Nemours & Co., Inc. Explosives Division, Ventube Division.
Thomas A. Edison, Inc.
Eimco Corporation.
Electric Storage Battery Co.
Engineering & Mining Journal.
Fiske Brothers Refining Co.
Gardner-Denver Co.
General Electric Co.
Goodman Mfg. Co.
Hercules Powder Co.
Ingersoll-Rand Co.
Jeffrey Mfg. Co.
Link-Belt Co.
Mancha Storage Battery Loco. Co.
Marion Steam Shovel Co.
Merco Nordstrom Valve Co.
Mine Safety Appliances Co.
Mining Congress Journal.
Oliver United Filters, Inc.
Pacific Foundry Co., Inc.
John A. Roebling's Sons Co.
S K F Industries, Inc.
Stephens-Adamson Mfg. Co.
Sullivan Machinery Co.
Tamping Bag Co.
Texas Company.
Union Wire Rope Corp.
Victaulic Co. of America.
Western Machinery Co.
Westinghouse Electric & Manufacturing Co.
Wood Shovel & Tool Co.

Fuel Conference to Meet at Lafayette

Following a recent meeting at Lafayette College of the general committee to make plans for the Fifth Annual Joint Fuels Conference of the A. I. M. E. and the A. S. M. E., to be held this fall in Easton, Pa., it was announced that the conference sessions will be held October 30 and 31, with the following day, November 1, to be devoted to visits to anthracite mines, cement plants and power plants in the Lehigh Valley.

William G. Christy, chairman of the Fuels Division of the A. S. M. E. and smoke abatement engineer for Hudson County, N. J., will have charge of the program, and Prof. Paul B. Eaton, head of the Mechanical Engineering Department at Lafayette, and Prof. W. B. Plank, head of the Mining Department, are associate chairmen in charge of local arrangements. Mr. Allen W. Thorson, assistant service fuel engineer, Chesapeake and Ohio R. R. Co., Detroit, Mich., is in charge of the arrangement for papers to be presented in the sessions.

Mines to Be Abandoned

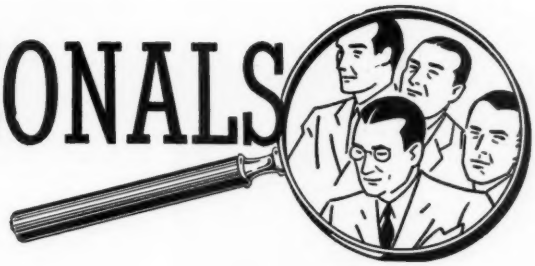
Two bituminous coal mines near Pittsburgh, Pa., which produced an estimated 23,000,000 tons in 38 years of continuous operation will soon be closed and abandoned if the petition presented to the Federal Court by H. K. Baker, a trustee in receivership for the Pittsburgh Terminal Coal Corporation is granted. The mines are the Mollenauer No. 3 and Horning No. 4. Mr. Baker explained that the seams at these mines are exhausted and that efforts to buy adjoining tracts have been unsuccessful. If court permission is granted the mining equipment will be removed from the shafts which have operated continuously since 1903. About 250 men will be affected by the shutdown.

Large Open Pit on Comstock Lode

The Consolidated Chollar, Gould & Savage Mining Company is mining a large deposit of gold-silver ore in the Gold Hill area of the Comstock Lode with power shovels and is sending 450 tons daily through the enlarged cyanide mill. The ore is said to average better than $5 a ton; the ore body is 250 ft. wide and estimated to extend for 1,200 ft.

More than 1,000,000 yds. of overburden have already been stripped and about 9,000,000 yds. of waste remain to be removed. The mill was erected last year at a cost of $225,000 and replaced a large flotation mill which was operated for several years.

PERSONALS



J. H. Cazier, formerly with the Mountain City Copper Company, in Nevada, is now engineer-geologist with the Lexington Mining Co., at Neihart, Mont.

Frank Smith, Bluefield, W. Va., is president of the newly formed Lando Coal Corporation, which will engage in mining activities in Mingo County. **A. G. Banford,** Charleston, W. Va., will be general superintendent of operations.

Charles E. Newmeyer, editor of *The Mining Record,* Denver, has been named by Governor Carr of Colorado as a member of the Industry and Mining Resources and Production Committee of the Colorado Council of Defense.

George W. Lauterbach was elected vice president of the Republic Coal & Coke Company, Chicago, at a recent meeting of the Board of Directors. At the same time, Don Richey was appointed general manager of sales.

Arthur V. Dunkle has resigned as electrical superintendent of the Sullivan Mining Company's zinc plant, Kellogg, Idaho, to become associated with the Bradley mining enterprises in California.

Willard V. Merrihue, manager of apparatus for General Electric Company, will address the National Industrial Advertisers Association Conference at Toronto on September 18. His subject will be "The Planning, Execution and Results of the G-E Triclad Motor Campaign—A Story of All-Out Promotion."

John H. Lease, engineer in the insulation contract department at the Joplin, Mo., plant of the Eagle-Picher Lead Company, has resigned to accept an engineering position with the Rust Furnace Company of Pittsburgh, Pa.

Dr. Arthur S. Adams, formerly assistant to President M. F. Coolbaugh at the Colorado School of Mines, was recently appointed assistant dean of the College of Engineering at Cornell University.

Vaden Lackey, manager of the Monro-Warrior Coal Co., at Nashville, Tenn., has been inducted into the Army, stationed at Fort Riley, Kans.

Robert S. Feeney, who has been general sales manager of the Continental Coal Company, Inc., at Ashland, Pa., has been appointed to head the company's sales office in New York City.

John P. Herndon, who has been in the Philippines for the past seven years engaged in the exploration and development of mining properties, has returned to the United States and is now residing in Silver City, N. Mex.

Lawrence B. Wright, of Wright, Dolbear and Co., New York City, consulting mining engineers, has established headquarters in San Francisco at 206 Sansome Street.

Mart F. Brennan, who has been president of the Anthracite District No. 9 of the United Mine Workers of America, with headquarters at Shamokin, Pa., has been made regional representative of the International Union of the Mine Workers of America.

Sam H. Morris, chairman of the Arizona State Copper Tariff Board, was recently in Washington presenting a brief prepared by the Arizona Department of Mineral Resources, opposing the compromising or abolition of the copper excise tax.

Charles M. Farrar has severed his connection with the Bituminous Coal Division in Washington and has returned to his former position as executive secretary of the Coal Merchants Association in Atlanta, Ga.

Dr. Luther F. Witmer, associate professor of metallurgy, Lafayette College, Easton, Pa., was host, shortly before the end of the scholastic year, to the John Markle Mining and Metallurgical Society at his farm in Cherry Valley, where the Society held its annual outing and election of officers.

F. B. Shay, mining engineer for the Foote Mineral Co., Philadelphia, is in Cuba investigating manganese, chrome, and other mineral deposits.

Wilson S. Kistler, formerly in charge of sales in the Long Island territory, New York, for the Weston Dodson & Company, has been called for Army service and is stationed at Langley Field, Virginia.

A. D. Whiteside, of the Iron and Steel Section of the OPM, Washington, has been appointed chairman of the recently organized iron and steel advisory committee. The advisory committee is made up of members appointed from the steel companies of the country.

Henry S. Wallace, Shelburn, has been made chief mine inspector for the state of Indiana, succeeding Fred Ferguson, who had held the post since 1937 and who resigned recently. Mr. Wallace has been chief deputy in the mines and mining bureau since 1937.

H. E. Hall, of Fallon, Nev., operating a scheelite mill in northern Churchill County, Nevada, has announced that the 25-ton mill on the property has been completely rebuilt.

Richard J. Lund, former editor of MINING CONGRESS JOURNAL and more recently with the Priorities Division of the OPM, Washington, has been appointed as chief of one of the eight newly created Commodity Branches of the OPM. They will deal with problems relating to certain materials and classes of materials in which importation or allocation problems are paramount. Mr. Lund will have under his control, asbestos, mercury, industrial diamonds, quartz crystals, platinum metals, radium, uranium kyanite, abrasives, diamond dies, and jewel bearings. All problems relating to priorities, production or purchases of these materials will be referred to him. **Andrew Leith** will be in charge of another Commodity Branch, dealing with manganese, chrome, ferro-silicon, zircon, titanium and rutile, columbium, tantalum and their alloys. Other Commodity Branch chiefs are: **Dr. Harry S. Rogers,** in charge of rubber, synthetic rubber and cork; **David A. Uebelacker,** in charge of nickel; **Harris K. Masters,** in charge of tungsten, molybdenum, vanadium, cobalt, antimony, and beryllium; **John A. Church,** in charge of copper, zinc, brass, other copper alloys and cadmium; **Erwin Vogelsang,** in charge of tin, lead and illmenite (pigment); and **Howard Sykes,** in charge of mica, fluorspar, cryolite, graphite, magnesite, and gypsum. The deputy director in charge

of all these branches will be **Philip D. Reed**, under the direction of E. R. Stettinius, Jr., director.

James Ivers, vice president and general manager of the Silver King Coalition Mines Co., Utah, has been named vice president of the Salt Lake Chamber of Commerce.

Henry Jones, of Hanna, Wyo., was elected by acclamation, president of the Old Timers Association of the Union Pacific Coal Company at the seventeenth annual reunion at Rock Springs, Wyo. At the same time **Port J. Ward**, of Superior, was elected vice president; **Andrew G. Hood**, Superior, was elected secretary; and **Frank Tallmire**, of Rock Springs, was elected treasurer.

Herbert J. Watt was recently appointed manager of sales for the western area for the Carnegie-Illinois Steel Corporation, and will make his headquarters in Chicago.

C. W. Pearsall has been appointed general sales manager for the Ahlberg Bearing Co., Chicago.

James E. Ash was recently made secretary-treasurer of the Coal Producers Association of Washington, in place of D. S. Hanley, resigned. Mr. Ash has also been appointed Commissioner of the Coal Producers Association in place of John E. Morgan.

Myron Powers has been made manager of purchases for the Chicago Pneumatic Tool Company, with headquarters in New York, it was recently announced. He was formerly in charge of purchases at the Cleveland office of the company.

John F. Byrne, of Pittsburgh, Pa., has been appointed general manager of Koppers United Company's newly-created blast furnace division, which includes the two blast furnaces recently purchased from the Granite City Pig Iron Company, Granite City, Ill.

Harry McCool, Jr., was recently made western sales representative for the steel and tube division of The Timken Roller Bearing Company, with headquarters at Dallas.

L. W. Grothaus, vice president of the Allis-Chalmers Company, Milwaukee, has been made head of a newly-created Priorities Management Department in the company, to take direction of all matters concerning priorities. G. V. Woody was made administrator of the department and O. S. Larkby, Jr., is assistant administrator.

Edward E. Hallihan was elected vice president of the Calumet Coal Company, Chicago, at a recent meeting of the Board of Directors.

J. M. Bowlby has been elected president of the Eagle-Picher Lead Company, succeeding **Joseph Hummel, Jr.** Mr. Hummel, who had been with the company for 50 years, was relieved of his active duties at his own request and was elected chairman of the board.

Mr. Bowlby has had a varied and successful career in the industrial field. After serving in the last World War, he was drafted by the director of sales of the United States War Department and, as chief of the Machine Tool Section, negotiated the sale of many millions of dollars of surplus equipment to France, Belgium, Poland, and other countries. In 1921 he became associated with Barrow, Wade, Guthrie & Co., accountants and auditors, and has been a general partner of that firm since 1928. For the last eight years Mr. Bowlby's activities have been largely directed to problems of industrial management. He will assume his new duties with Eagle-Picher on September 1.

Gerald B. Gould, president of the Fuel Engineering Co., New York, has been appointed advisory consultant on coal prices in the fuel section of the Office of Price Administration and Civilian Supply.

E. D. Davis is the new director of the Washington State Department of Conservation and Development.

J. P. Hewitt, president of the Pacific Smelting & Refining Co., Portland, Ore., was recently in Washington consulting with OPM officials about establishing a zinc refinery to treat ores from the Bonneville area.

J. M. Dougherty has been made advertising manager for the Consolidation Coal Company. He was formerly western sales manager, with offices in Chicago. **Carl Clayton** succeeds Mr. Dougherty in the position of western sales manager.

H. R. Banks has been appointed superintendent of milling operations at the Sullivan concentrator for Consolidated Mining and Smelting Co., of Canada, Ltd.

Edward T. McCormick has been appointed head of the Fuels Division of the Office of Production and Civilian Supply under Leon Henderson in Washington. Mr. McCormick comes from Arizona and is a certified public accountant; he had formerly been with the SEC and more recently adviser on Priorities to the consumer member of the National Defense Advisory Commission.

H. C. Wilmot, vice president of Bonanza Mines in southern Oregon, has been engaged as consulting engineer by British Columbia Magnesium Co., Ltd., which has deposits of hydromagnesite in the Williams Lake area, Canada, and which intends to develop these magnesium deposits if further exploration warrants.

David H. Devonald, general superintendent of operations, Peabody Coal Co., was chairman of the Illinois operators' negotiating committee, which met recently with the United Mine Workers in that state to draw up a new wage contract based on the Appalachian agreement.

W. N. Wetzel was elected president for 1941-1942 of the Rocky Mountain Coal Mining Institute, at the annual meeting held in Denver the latter part of June. He is general superintendent of the United States Fuel Company at Hiawatha, Utah. Other officers elected were: **Alex C. Burt**, of the Colorado-Utah Coal Company, Mt. Harris, Colo., as vice president for Colorado; **Clarence E. Uhland**, of the Gallup-American Coal Company, Gallup, N. Mex., as vice president for New Mexico; **W. D. Bryson**, of the Utah Fuel Company, Castlegate, Utah, as vice president for Utah; **R. P. Hogan**, Colony Coal Company, Rock Springs, Wyo., as vice president for Wyoming; and secretary-treasurer, **Fred W. Whiteside**, Denver, Colo.

David P. Strickler, president of the Stratton Cripple Creek Mining and Development Company, Colorado Springs, Colo., has also assumed the position of general manager of the company. **J. O. B. Keener**, of Cripple Creek, will continue as general superintendent for the company.

— *Obituaries* —

Daniel H. Pritchard, president of the Pritchard Coal Co., of Charleston, W. Va., died of a heart attack on July 14, while en route to Binghamton, N. Y., to enter his son in a summer camp. He was 45 years old.

John Gillie, mining engineer, who lived and worked in Butte for over 60 years, died in June at the age of 82. He was manager of mines for the Anaconda Copper Mining Company from 1914 to 1924, and during the past 17 years had been consulting engineer for the Anaconda Company.

James B. Hilton, president of the Columbus Mining Company, passed away at his home in Chicago, Ill., on July 20, after a long illness.

Mr. Hilton had been in the coal business in Chicago since 1909, when he became associated with Arthur L. Allais. He was a director and officer of the Columbus Mining Company from the time of its organization in 1915, and succeeded to the presidency upon the death of Mr. Allais in 1937.

NEWS and VIEWS

Increased Pig Iron Capacity

An increase in pig iron capacity of 6,508,950 tons was recommended by the Office of Production Management in July as an essential step in maintaining and increasing the production capacity of the steel industry.

Government financing of this increase will be required "and is so recommended by us for the best consideration of the Defense Plant Corporation," the OPM said in a letter transmitting the proposal to Jesse Jones, the Federal Loan Administrator.

William S. Knudsen, director general of the OPM, wrote Mr. Jones that an initial expansion of pig iron capacity was urgently required because present and prospective demand for pig iron was far in excess of capacity and the demand for scrap iron was also in excess of the available supply.

Industrial Exhibit at Bluefield

The Seventh Annual Southern Appalachian Industrial Exhibit will be held at Bluefield, W. Va., on August 19 to 23, inclusive. It is expected that about 175 manufacturers will have exhibits at the Bluefield Coal Show, with displays of a giant locomotive and innumerable other pieces of equipment and supplies.

B. B. Housman, of the Pocahontas Operators Association, is director of the show for the seventh straight year. William Beury is general chairman in charge of arrangements.

Fund Collected to Fight Future Wage Cuts

A special assessment of $1 has been levied on all those members of the United Mine Workers of America working more than a certain number of days per month, and to be collected under the check-off arrangement in the wage contract by the operators in the anthracite and bituminous regions. It is said that this money is to be a union "war chest" and will be used to fight any attempt to reduce miners' wages after the war when market conditions return to normal.

It is estimated that the assessment will raise about $400,000. The action was explained by an official statement over the signatures of John L. Lewis, president; Philip Murray, vice president; and Thomas Kennedy, secretary-treasurer of the U. M. W. of A., as follows:

"While the trend of the times indicates wage increases and the rise of commodity prices, every economist is of the opinion that the pendulum in due time, following the national emergency, will move in the opposite direction.

"If we take a page from our own history following the World War you will find that the United Mine Workers of America was compelled to fight in every coal district in this country to protect its wage standards in the face of falling prices and wages. Very costly strikes were engaged in after the last war and the finances of our organization were dissipated as a result of these troublesome times.

"Only in our anthracite jurisdiction were we able to maintain the wages secured up to 1923. The lesson learned from our experiences from 1923 to 1925 should not be lost."

Famous Diamond Mine to Be Flooded

The famous De Beers diamond mine at Kimberley, South Africa, will soon be allowed to fill with water, according to a recent dispatch in the South African *Mining and Engineering Journal*. For 33 years the mine has continuously been kept pumped out, but since diamonds can be recovered more cheaply from other mines in South Africa, it now seems unlikely that the property will again be worked for the next 50 years, if ever. When mining ceased in 1908 the open cut was 500 ft. deep and the hoisting level was at 2,040 ft. Total production from the time the mine was discovered in 1870 until it was closed was approximately $360,000,000 in value.

In the long distant future the mine may be reopened, as it is not by any means worked out, but since the properties at Dutoitspan, Wesselton and Bultfontein can be worked more cheaply, it is not considered that there is need to keep the De Beers mine unwatered.

Bull Valley Iron Deposits Important

In connection with the probable development of the steel industry in Utah, the iron ore deposits of Bull Valley are receiving consideration. These large deposits lie on the Utah-Nevada boundary, east of Caliente, Nev. Senator Murdock, of Utah, has been active in securing an appropriation of $200,000 for the diamond drilling and survey of the deposits, which are reported to be of high grade and considerable magnitude.

Tungsten Production Begins at Yellow Pine

It was recently announced that production of scheelite concentrates would begin this summer from the Yellow Pine mine of the Bradley Mining Co., near Stibnite, Idaho. This is the property which was being worked for antimony, when, in the course of diamond drill investigations by the U. S. Bureau of Mines, high grade tungsten ore was cut by the drill. Following the discovery of tungsten, work was rushed this spring on the completion of a mill to handle the scheelite, and mining development is progressing rapidly. The property is under the management of John D. Bradley.

Regional Meeting A. I. M. E. to Be Held at Duluth

The bustling port of Duluth and the famous Minnesota iron ranges will be the setting for the regional meeting of the A. I. M. E. on August 12 to 15, inclusive. Arrangements are now under way for plans of the technical session, details of which will be announced later. Inspection trips are also being arranged to many points of interest in the iron range country. A trip will be made to Coleraine at the western end of the Mesabi range, for an inspection of various pits and iron ore washing plants, with a night to be spent in Hibbing. On the following day a trip will be taken through the open pits in the Hibbing area, returning by bus to Duluth that evening. On August 15 a trip will be made about Duluth Harbor, from which transportation and loading facilities, such as ore docks and freighters, can be inspected.

Magnesium Plant in Washington

Eastern Washington State will be the site of new refining plants if plans recently announced by the Office of Production Management for increasing the output of metallic magnesium are carried through. It has already been announced that a 12,000-ton refining plant would be built in the area by the Todd-California Shipbuilding Corporation, affiliate of the Six Companies and Henry F. Kaiser interests. It is not yet determined whether these most recent plans envisage an enlargement of the plant previously announced or the construction of new plants by other interests.

The Bonneville power authority would supply 35,000 kilowatts annually for this purpose.

English Coal to Canada Instead of France

One of the epic stories of the war involving coal supply was recently reported by special correspondence to *The Black Diamond*, upon release of a statement issued by the Wartime Prices and Trade Board.

When, late in May of last year, the principal coal mining areas of France were over-run by the Germans, the British quickly made arrangements to send over English coal in large quantities to assist French industry. Thirty-five ships carrying capacity loads of British coal were en-route by the time France asked for an armistice. Some of these boats were actually in process of discharging their cargo in French ports when all were ordered to turn about to proceed at full steam to Canada. Small coastwise colliers and large ocean freighters were headed westward, many unprovisioned for the long journey, which was to be made without protection of convoy.

On June 30 the Wartime Prices and Trade Board of Canada was notified by the British Ministry of Shipping that a number of boats of British registry, loaded with various kinds of coal and coke, required to be diverted immediately by reason of the military situation then developing in order that the boats and their contents might not fall into enemy hands. Provision was immediately made for handling and disposing of this coal in Canada. Over 200,000 tons of unclassified bituminous coal was received in Canada as a result of this action.

Montana Mining Association Meeting

The Mining Association of Montana will hold its seventh annual convention on September 5 and 6 in the adjoining towns of Cooke City-Silvergate, at the northeast entrance of Yellowstone National Park. Arrangements are being made to care for convention-goers in modern tourist cabins and two chalets at Cooke City and Silvergate. The dinner dance on September 5 and the banquet on the evening of September 6 will probably be held at the Gorham Chalet, Silvergate, and the business sessions also will be held there.

Arrangements for the program include addresses on geophysical prospecting and strategic minerals by Dr. Francis A. Thomson, president of the Montana School of Mines; Dr. E. S. Perry and Dr. George L. Shue, members of the staff of the School of Mines. The aims of the newly established Montana Department of Industrial Hygiene will be outlined in talks by Dr. L. M. Farmer, director, and Mr. H. T. Walworth, engineer. Annual reports of committees will also be presented.

A large attendance is expected to take advantage of the opportunity to visit the pleasant vacation area of Yellowstone Park and to take part in the proceedings of the meetings.

CARLTON TUNNEL COMPLETED

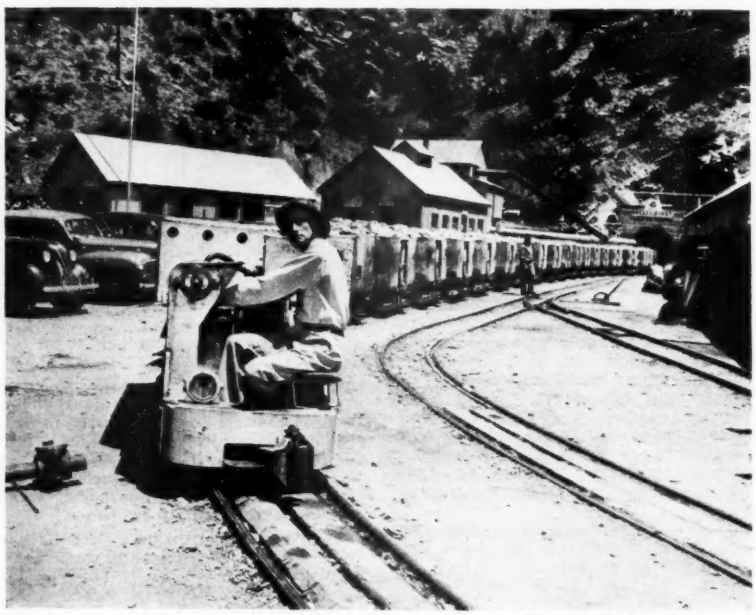


Photo by Barbre, Denver.

Supt. John Austin, of the Carlton Tunnel, with the last muck train to be brought out of the tunnel. The tunnel was officially completed on July 25, after 670 working days. The overall average of progress was 48.5 feet per day

Rocky Mountain Coal Mining Institute Opposes St. Lawrence Project

At the meeting of the Rocky Mountain Coal Mining Institute held in Denver, Colo., on June 28, resolutions were adopted. (1) Protesting the development of the St. Lawrence Waterway Project, and (2) Recommending that the Priorities Division of the OPM give a justifiable and reasonable priority rating to the needs of the coal industry. The resolutions were as follows:

RESOLUTION NO. 4

WHEREAS the Rocky Mountain Coal Mining Institute is aware of coal being a basic commodity and necessary to the industrial and economic life of the nation; and

WHEREAS coal is a vital part in the defense program of the nation, by virtue of its definite need in the steel, power and transportation industries: Therefore be it

Resolved, That the Rocky Mountain Coal Mining Institute earnestly recommends to the Priority Board of the United States Government that a justifiable and reasonable priority rating be given to the needs of the coal industry, and that a copy of this resolution be mailed to the Priority Board, to the Secretary of the Interior, each Senator and Congressman of the United States, and to the National Coal Association and the American Mining Congress.

RESOLUTION NO. 5

WHEREAS the Rocky Mountain Coal Mining Institute views with alarm the current national power policies, which ignore the economic and ultimate factors of employment, during both this emergency and post-emergency period; and

WHEREAS the cost of coal-burning, steam-generated power appears to be entirely ignored in the continued preparation for the construction of hydro-electric plants, costing many times as much, and taking three or four times as long to build; and

WHEREAS coal-burning, steam-turbine plants of large capacity are now known to have passed water power in efficiency and low cost as evidenced by the fact that one kilowatt is now generated with nine-tenths pound of coal, with modern, large capacity turbines: Therefore be it

Resolved, That the Rocky Mountain Coal Mining Institute protests the continued proposals of hydro-electric power and recommends the construction of coal-burning, steam-turbine generated electric power plants; and that it be further specifically

Resolved, That the Rocky Mountain Coal Mining Institute protest the development of the St. Lawrence Waterways Project at this time as not being necessary in the interest of national defense, and detrimental to the interests of American business; and be it further

Resolved, That a copy of this resolution be sent to the Secretary of the Interior and to each Senator and Congressman of the United States as well as to the National Coal Association and the American Mining Congress.

Jones & Laughlin Enlarging Iron Ore Resources

The Jones & Laughlin Steel Corporation has announced that, to increase its pig iron and steel output, the company has leased a large tract of land containing iron ore deposits in St. Lawrence County, N. Y. The tract consists of 3,200 acres, situated 65 miles east of Watertown, N. Y., on the western slope of the Adirondack Mountains, and is being leased from the Benson Iron Company, Inc. Its location is such that it can be operated during the entire year, in contrast to the operations of the Lake Superior region, which are closed during the winter months. The property is to be developed to supplement present ore operations and properties of the company in Minnesota and Michigan.

Exploration has been under way on the property for more than a year, but it is as yet only in the early development stage. The concentrate from these ores will have a higher iron content than Lake Superior ores, making possible a material increase in iron production for the same volume of material handled in the blast furnace, according to H. E. Lewis, president of the company. He added that the Benson concentrates will be very low in phosphorous, which make them particularly desirable for use in the Bessemer process.

Construction of plant and development of the mine, together with rail shipping facilities, will cost $2,750,000 and will require 18 months for completion after work is started. The production is expected to be about 800,000 tons of concentrated and sintered ore per year to augment the present production of 4,000,000 tons of iron ore now being mined in the Lake Superior region each year by the company.

Foreign Lead to be Purchased

The Metals Reserve Company, the RFC subsidiary which operates the stockpiling program, reached in July the final stages of negotiation to acquire lead from producers of this metal in Mexico, Canada and Peru, the total amount of which is to be bought may run as high as 200,000 tons.

It was understood that Mexico may supply as much as 15,000 tons monthly and Canada perhaps a little less than half as much, with a lesser tonnage from Peru.

Estimates indicate that the United States consumed about 80,000 tons of lead in June, and of this amount roughly 15,000 tons were imported. The May consumption set a record at about 90,000 tons of which about 20,000 tons were produced outside of the United States. Notwithstanding these imports, the total supply has been insufficient to meet demands. Stocks of lead on hand have been sharply reduced. At the end of May, pig lead in the hands of domestic refiners was only a little more than 34,000 tons. The new buying program will act to make up this deficiency in supply.

Coal Mines to be Inspected By Civil Service Appointees

In May, 1941, Congress passed an act authorizing the United States Bureal of Mines to make periodic inspections and investigations of coal mines. The Bureau is charged with the responsibility for obtaining information on health and safety conditions, accidents causing serious injury or loss of life, and the occupational diseases of coal mining. A staff of inspectors is to be appointed from the employment lists set up as a result of an examination recently announced by the Civil Service Commission.

Coal mine inspectors will be paid salaries ranging from $2,600 to $4,600 a year and will be assigned to work in the Bureau of Mines at various points throughout the country. No written test will be given but applicants will be rated on their training and experience. For the two higher grades ($3,800 and $4,600 a year), broad and progressive practical experience in connection with the safety-of-operation of coal mines is required, and some of this experience must have been in a supervisory capacity. For the assistant and associate grades ($2,600 and $3,200 a year respectively) experience in practical coal mining is required which included responsible experience in mine safety work. For all these jobs, an applicant must show that his experience and training have included coal-mine operating or safety work, or technical work in practical mining engineering which gave him a thorough knowledge of the essentials of coal mine inspection. For all but the assistant grade, provision is made for the substitution of college engineering courses for some of the prescribed experience.

The Commission urges qualified persons who have reached their thirtieth birthday, who have not passed their fifty-fifth birthday, who are not over 74 inches in height, and who can meet the high physical standards necessary for this work to file their applications. Applications will be accepted at its Washington office until December 31, 1941. Further information and application forms may be obtained at any first- or second-class post office or from the Civil Service Commission.

Australia Copper Price Increased

The rapidly growing consumption of copper for defense operations in Australia has created a pressing need for greater output of that metal. According to a recent announcement in the *Chemical, Engineering and Mining Review*, the prices commissioner for the Australian Commonwealth recently fixed the price of refined copper at 86 pounds, 10 shillings per ton, the purpose of the increase being to give special inducement to producers, especially to the small producers in Queensland. This price is equivalent at the official rate of exchange to a little less than 14 cents per pound.

Battelle Institute Enlarged

The facilities of Battelle Memorial Institute, Columbus, Ohio, are being enlarged for the fourth time in recent years. An addition to cost $160,000 is being made to the process metallurgy laboratory building, Clyde E. Williams, Institute director, has announced. Additional space demands of enlarged research programs concerned with the study of chemical and metallurgical processes on a pilot-plant scale will be provided for when the new structure is completed. The expansion is the result of a continued increase in the Institute's research for industry, particularly in the fields of coal preparation, raw materials beneficiation, hydrometallurgy, pyrometallurgy, electrometallurgy, and foundry practice.

New Mill in Tri-State

In July, the new Snapp mill of Kansas Explorations, Inc., 2½ miles northwest of Oronogo, Mo., was placed in operation. It is the largest and most modern concentration plant to be built in the Missouri section of the Tri-State district in many years. The mill has a capacity of 50 tons per hour. Approximately 100 men are employed, and this number will be increased as the mines are opened up and as the mill is increased to capacity. The hoist for the inclined tram from the field shaft to the mill hopper is installed in the screen room over the mill hopper.

THE Leahy
HEAVY DUTY
No-Blind VIBRATING SCREEN with TRI-VIBE –for Fine Mesh Screening
LARGE CAPACITY—CONTINUOUS UNIFORMITY—PROVEN ECONOMY
90% to 97% Efficiency Rating. Only ½ H. P. Required for Maximum Load.
Write for Bulletin No. 14-H.
THE DEISTER CONCENTRATOR COMPANY
The Original Deister Co., Est. 1906
915 GLASGOW AVE. FORT WAYNE, IND.

Government Services to be Moved West

To relieve congestion in Washington, D. C., a movement is under way to transfer some services of the Government to areas where that service particularly applies.

Salt Lake City, Utah, has been announced by Secretary Ickes of the Interior Department, as the new western headquarters for the Grazing Service, as a first step toward achieving this result. The staff of the Grazing Service was to move immediately, and the transfer will make available 29 rooms in the Interior Department building which will be immediately occupied by the newly organized office of the Petroleum Coordinator for National Defense.

The Secretary announced that within a radius of 500 miles of Salt Lake City are most of the public grazing lands of the United States and, by location of its offices at that point, the Grazing Service will be within easy reach of all of its field problems and much heretofore necessary travel from Washington headquarters to the field will be eliminated.

Copper Prices Studied

A meeting was recently called by the OPM and OPACS in Washington, with members of the copper industry, at which Government officials requested the industry representatives be prepared to present estimates as to how much output could be increased from present copper properties, from other higher cost sections, and from new developments. The estimated higher price that would be needed for this additional production and the length of time such price would have to prevail also were sought. It was added that if Government financing were necessary to bring out increased production, it would be available, and that companies in making their estimates of larger production should bear in mind requirements for 1942 and 1943.

At the meeting copper trade executives reported that United States production might be increased 150,000 tons a year, if a bonus or subsidiary price above the current 12-cent level was allowed for the additional output. It would require from three months to three years to make all this copper available. This would be equivalent to a gain of 13.8 percent based upon present rate of production. Government officials stressed the need for more copper in defense, as the combined present United States mine and scrap production, plus all Latin American output will fall far short of estimated military and civilian needs in 1942. The OPM recently reported that by mid-1942 armament requirements alone would total 1,420,000 tons.

On the matter of price it was revealed that while OPACS is primarily interested in keeping the price level in line, recognition would be given to production. Thus if it was found necessary to treat special situations at a different price level, such action would be taken.

This first meeting was general in nature and no details were available. Of the estimated 150,000 tons of additional production, it was the opinion that perhaps 40,000 tons of the total would come from new developments which would require more than three years to be brought into production. The remaining 110,000 tons would come through working lower grade ores not now commercial at prevailing prices, production from higher cost old workings and abandoned properties, retrieving copper from old tailings dumps by reclamation operations, and reverting to higher cost processing programs.

On the same day the Arizona Small Mine Operators Association sent a telegram to E. R. Stettinius, Jr., in which it was estimated that at a 14-cent price smaller mines in that state alone could produce an additional 27,750 tons of copper a year at a capital expenditure of $2,500,000. The dispatch claimed further that another 16,500 tons could be obtained if a 16-cent price was assured.

Manganese Steel Versus Carbon Steel For Drill Rods

The U. S. Bureau of Mines recently released Report of Investigations No. 3566, titled "Comparison of Manganese Steel with Carbon Steel for Detachable-Bit Drill Rods." This report, by Wing G. Agnew, gives the results of tests carried out by the Mining Division of the Bureau on the relative durability of manganese steel drill rods and carbon steel drill rods for use with detachable bits. Three lengths of rods were employed, 2, 4, and 6 ft.; all rods were 1¼ in. round, with lugged shanks. They were all fabricated in one shop and were threaded for one type of detachable bits. The heat treatment given each set of rods is described, and the test procedure employed in arriving at a comparison. The drilling time in minutes of each type and length of rod is given, and the number of feet drilled to the point of failure. The average for all carbon steel rods to the point of failure was 253.66 minutes of drilling time and 195.91 ft. drilled. For the manganese steel rods the average of all lengths was 381.86 minutes drilling time and 298.23 ft. drilled to the point of failure. Other comparative results are summarized.

West Virginia Mining Institute

The West Virginia Coal Mining Institute will hold its annual meeting in Morgantown, W. Va., on November 7 and 8. It is expected that approximately 150 to 200 persons will be in attendance. The annual banquet will be held on Friday evening, November 8, in the ballroom of the Hotel Morgan, Morgantown.

Copper Alloys and Products Controlled

In July, E. R. Stettinius, Jr., Director of Priorities, OPM, made major amendments to the General Preference Order providing priority control over copper. The amendments to the copper order (M-9) extend control to cover copper-base alloys and fabricated products made from copper or from copper-base alloys, such as brass or bronze. The original order was designed to regulate the distribution of refined copper in prefabricated form by refiners.

In the first order it was provided that refiners, after setting aside a quantity of copper for an emergency pool, were to distribute the remaining copper so that each customer would receive an equal percentage of the orders he had placed. Because of the shortage in copper, the amendment removes this provision and stipulates that, after copper has been set aside for the pool, defense orders must be given preference over non-defense orders. The amendment provided that for July the emergency pool, out of which the Director of Priorities made allocations to meet urgent needs, was to remain at the same figure—20 percent of April production. It was stated, however, that additional changes are to be made in the copper order later on to provide a fuller measure of control over all copper supplies.

Mercury Output Higher

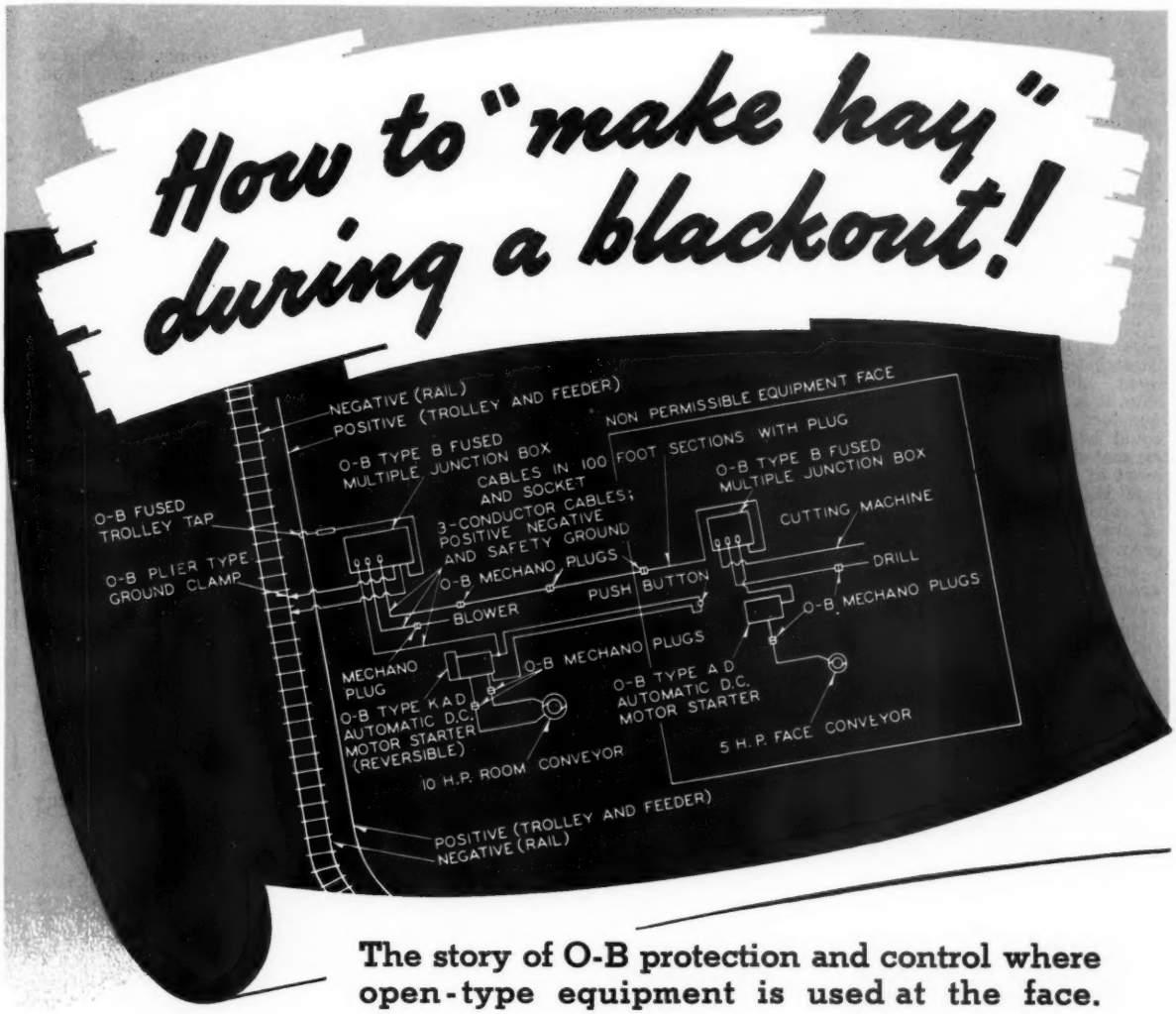
Domestic production of mercury amounted to 3,600 flasks in May, 100 flasks above March and April, and only 100 flasks below the peak for recent years of 3,700 in December, 1940, according to a recent announcement of the Bureau of Mines. Consumption which dropped sharply from 4,000 flasks in March to 3,200 in April, rose again to 3,500 in May. The upturn in May came as a surprise in view of the fact that the April total greatly exceeded the average monthly rate for 1940.

In May consumption of mercury amounted to 3,500 flasks, an increase of 300 flasks over the quantity reported for April and 1,200 flasks below that reported for February, which was the highest rate attained in many years. Consumers' and dealers' stocks at the end of May decreased to 10,700 flasks from the 11,700 flasks on hand at the end of April.

PETER F. LOFTUS
Consulting Engineers
ENGINEERING AND ECONOMIC SURVEYS, ANALYSES AND REPORTS ON POWER APPLICATIONS AND POWER COST PROBLEMS OF THE COAL MINING INDUSTRY
Oliver Building Pittsburgh, Pa.

L. E. YOUNG
Consulting Engineer
Mine Mechanization
Mine Management
Oliver Building Pittsburgh, Pa.

How to "make hay" during a blackout!


NEGATIVE (RAIL)
POSITIVE (TROLLEY AND FEEDER)
O-B TYPE B FUSED MULTIPLE JUNCTION BOX
CABLES IN 100 FOOT SECTIONS WITH PLUG AND SOCKET
NON PERMISSIBLE EQUIPMENT FACE
O-B TYPE B FUSED MULTIPLE JUNCTION BOX
O-B FUSED TROLLEY TAP
3-CONDUCTOR CABLES; POSITIVE, NEGATIVE AND SAFETY GROUND
CUTTING MACHINE
O-B PLIER TYPE GROUND CLAMP
O-B MECHANO PLUGS
DRILL
BLOWER
PUSH BUTTON
O-B MECHANO PLUGS
MECHANO PLUG
O-B MECHANO PLUGS
O-B TYPE K A D AUTOMATIC D.C. MOTOR STARTER (REVERSIBLE)
O-B TYPE A D AUTOMATIC D.C. MOTOR STARTER
10 H.P. ROOM CONVEYOR
5 H.P. FACE CONVEYOR
POSITIVE (TROLLEY AND FEEDER)
NEGATIVE (RAIL)

The story of O-B protection and control where open-type equipment is used at the face.

Remember the time the cable burned out in North 10 - - and you had to send over to the warehouse at Milldale for a new one so you could get that loader going again? Or the time the motor on the mother conveyor went up in smoke because that addle-pated kid threw it across the line when the belt was loaded? By the time you got the motor rehabilitated and that section in production again, you saw plenty of juicy profits fly out the doorway, we'll bet!

Well - - you can banish those nightmares and keep those "electrical blackouts" under control by installing a complete O-B protective and control system. Sectionalize your power circuit with O-B Time Limit Circuit Breakers or Safety Feeder Switches! Prevent cable burnouts and motor overloads with O-B Fused Trolley Taps and Fused Junction Boxes. And as for those conveyor motors, safeguard them from overloads and keep your conveyors on the job with O-B Automatic D. C. Motor Starters. For more information regarding O-B equipment, see your O-B representative!

2230-M

OHIO B BRASS

MANSFIELD OHIO · U · S · A

Canadian Ohio Brass Company, Ltd. Niagara Falls, Ont., Canada

COMPLETE O-B PROTECTION FOR CONTINUOUS PRODUCTION

Silver Instead of Tin

A committee of the National Academy of Sciences, studying the means to bring about conservation of, and substitution for, tin, has reported to the OPM that silver may be substituted extensively for tin in solders. The committee pointed out that with the exception of imports from Bolivia, tin used in this country travels over long sea lanes on which shipping might be interrupted. The report continued:

"By an all-out substitution in every possible line, which would require construction of much special equipment, and at least temporary hardship, it is believed that at least three-quarters of the tin ordinarily used could be replaced." The committee estimated that large scale replacement of tin in solders, plus a reduction in tin use already being made by can manufacturers at the request of the OPM, would reduce total tin consumption about 25 percent.

Sixty-six million ounces of silver annually should be sufficient for "all-out" replacement of tin solder, the group said. Forty to fifty pounds of tin might be replaced by 2½ to 5 lbs. of silver, it added, and at present prices for tin and for industrial silver the raw material cost of 2½ percent silver solder is practically identical with that of an equal volume of solder composed of 45 percent tin and 55 percent lead. Actual present prices of silver solders appear to be more above those of lead solders than this ratio of raw material cost indicates, the committee said, but this may be because of the relatively small production of silver solders so far.

Two Collieries to be Reopened

The Pine Knot and Thomaston collieries, former Philadelphia & Reading operations in the Heckscherville Valley district of the lower anthracite region, Pennsylvania, will shortly be reopened if plans announced by W. Parkes Millington, trustee for the Pine Hill Coal Company, operator of the Oak Hill mine, are carried through. It is reported that the RFC has granted a loan of $140,000 for the purpose.

New Magnesium Plant Projected

Subject to approval by the Defense Plant Corporation, plans have now been completed for the building of the second largest magnesium metal plant in the country to be erected by the Mathieson Alkali Works at Lake Charles, La., where the company already operates a large alkali plant.

The new unit will produce between 40 and 50 tons of magnesium per day, or 15,000 to 20,000 tons per year. It will cost about $16,000,000, will take a year to build, and will be financed by government funds.

The source of the magnesium will be dolomite, obtained from a large deposit which the company owns near Burnett, Tex.

BOOK REVIEWS

1941 COAL MINE DIRECTORY, *United States and Canada. McGraw-Hill Publishing Co., Inc., 330 W. 42nd St., New York City. Price* $7.50.

The Coal Mine Directory, published annually, is too well-known to require elaborate comment. It contains an alphabetical index of mines, producing companies and sales organizations. The principal division of the book, is devoted to a directory of coal mines by states, including with each state a breakdown of company and mine offices by counties and arranged according to cities and towns. Included are mining companies with a greater capacity than 100 tons per day. The section for Pennsylvania includes not only bituminous mines but anthracite mines as well.

ANALYTICAL CHEMISTRY OF INDUSTRIAL POISONS, HAZARDS AND SOLVENTS, *by Morris B. Jacobs. Published,* 1941, *by Interscience Publishers, Inc., 215 Fourth Avenue, New York City, N. Y. Price* $7.00 *net.*

This volume is a valuable contribution to the literature on analytical chemistry in industrial hygiene and is a complete treatise on the subject.

It covers all types of industrial poisons, their sampling, detection, measurement and treatment. Of most importance to the mining and metallurgical industries are chapter 5, titled "The Chemical and Microscopic Estimation of Dust," chapter 6, "The Chemical and Microscopic Estimation of Silica," chapter 7, "The Danger of Metals, Lead, Mercury and Arsenic," and chapter 8, "Other Harmful Metals."

MINING DIRECTORY OF MINNESOTA, 1941, *by John J. Craig. Bulletin No. 29 of the University of Minnesota, Institute of Technology and Mines Experiment Station.*

This latest edition of the *Directory*, issued annually since 1920 consists of five parts, giving maps and full information concerning the name and location of all operating mines, exhausted mines and reserve properties, as well as beneficiation plants. Also included are general statistics on the iron ore industry. This edition contains seven additional tables not before found: classification of iron ore shipments from Minnesota and assessed valuation of iron ore in Minnesota, to bring up-to-date the tables in Information Circular No. 2, "Statistical Data on the Mesabi Iron Range;" rail and lake freight rates on iron ore; statistics on the Minnesota occupation tax; base prices of Mesabi nonbessemer ore; and average production costs of iron ore in Minnesota, with costs shown separately for open pit and underground operations. A final section contains a partial list of men who are associated with the mining industry of the state.

MINE-TIMBER STUDIES. *Colorado School of Mines Quarterly, Volume 36, No. 3, may be obtained from the Department of Publications of the Colorado School of Mines, Golden, Colo., at a cost of fifty cents.*

Included in this volume are two papers: "Stresses in Mine-Drift and Timber-Sets," by Raymond L. Grazier, and "Increasing the Endurance of Drift-Sets," by Robert B. Gayer. Both are reports on research carried on under the direction of the Department of Mining at the Colorado School of Mines. 65 pages, including 26 half-tone reproductions of photographs, 17 diagrams and charts, and 17 tables.

The first paper reports on laboratory tests on various phases of model timber-sets, using direct loading, uniform distributed loading, and uniform distributed loading with a systematic interruption of the load. Tabulation of the data resulting from each test, together with sample calculations for each type of loading used is presented.

In the second paper the results of loading on cap-and-post arrangements are recorded. The notes and data for 45 individual tests under various controlled loadings are given together with diagrams. Photographic records were made of two representative tests at progressive stages of loading and these records are reproduced.

PUBLICATIONS OF INTEREST

Miscellaneous

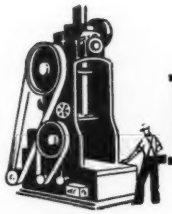
STATISTICAL DATA ON THE MESABI IRON RANGE, MINNESOTA, by John J. Craig, Metallurgist. Information Circular No. 2 of the Mines Experiment Station, University of Minnesota, Institute of Technology. The compilation gives a complete statistical history of iron mining operations on the Mesabi Range since mining started in 1892. 69 pp. and maps.

THE DEPENDENCE OF ARIZONA ON THE MINING INDUSTRY. A statistical compilation by the Department of Mineral Resources of the State of Arizona, J. S. Coupal, Director. 46 pp.

CONTRIBUTIONS TO CANADIAN MINERALOGY, 1940. No. 44 of the Geological Series of the University of Toronto Studies. Ten articles on various phases of Mineralogy, published by the University of Toronto Press, Toronto, Canada. 119 pp.

PRELIMINARY GEOLOGIC MAP OF PARTS OF THE ALTO PASS, JONESBORO, AND THEBES QUADRANGLES, Union, Alexander, and Jackson Counties, Ill. Report of Investigations No. 70, by the Illinois State Geological Survey, Urbana, Ill., by J. Marvin Weller and George E. Ekblaw. 26 pp.

TECHNOLOGY, EMPLOYMENT, AND OUTPUT PER MAN IN IRON MINING, published by the National Research Project of the Works Progress Administration in cooperation with the United States Bureau of Mines. A 264-page report dealing with long-time trends in employment and production, major factors increasing output per man, changes in labor requirements, employment prospects in iron mining, and other similar subjects. Includes numerous charts and statistical tables relating to employment, output, etc.



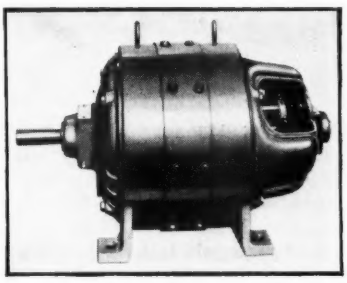
MANUFACTURERS' Forum

Protective Insoles

Protective insoles for wearing inside rubber boots and shoes have new comfort because of a new type of construction. Two thin protective layers of a special plastic material assure puncture-resistance and make these insoles so flexible the sole may be rolled in a circle. A woven, glove-fitting cover gives cushion-comfort. They are non-absorbent and weigh but two ounces. Available in sizes from 6 to 11. E. D. Bullard Co., 275 Eighth St., San Francisco, Calif.

Regulator, Exciter in One Unit

Efficient quick-response regulation for automatically holding constant output on d-c and a-c machines is available with the new "Regulex" exciter developed by the Allis-Chalmers Manufacturing Company. This rotating regulator reduces the first cost of



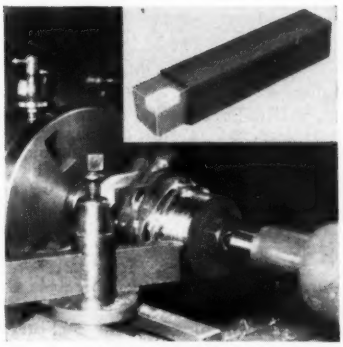
a generator or motor installation because exciter and regulator are combined in one unit. The Regulex consists of a differential amplifier for controlling the excitation on d-c motors and generators to give constant voltage, current, speed or tension.

The Regulex was originally developed for steel mill use, principally for giving constant tension on winding and unwinding coils. It is now being applied to other steel mill drives and mine hoists.

"Regulex" exciters are being developed for all sizes of d-c machines, and they are applicable to a-c synchronous motors, generators and condensers. They will also be applicable to constant tension drives in paper mills.

Steel-Cutting Carbide Tools

Improvements in their various grades of Kennametal steel-cutting tool carbides to provide both greater hardness and greater strength than previously present, has been announced by McKenna Metals Company, 168 Lloyd Ave., Latrobe, Pa.

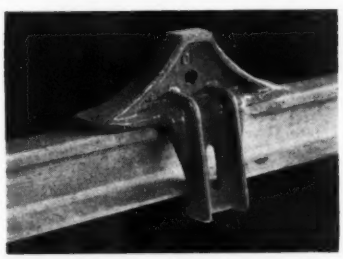


Kennametal grade KM is used on steel cutting jobs, in lathe and boring tools for machinery alloy steel and carbon steel forgings, castings, and bar stock for both continuous and interrupted cuts. Grade KM is exceptionally strong, enabling it to be used for shaping hard armor plate, as well as for turning and facing over interruptions. This grade is widely used in shell turning tools, where its high strength has been found advantageous in cutting off tools and base facing tools.

Kennametal grades KH and K3H are used on light finishing cuts or where the steel being cut is very soft, as in SAE 1010, SAE 1020, or free machining steels. Grade K4H is extremely hard and is used for precision boring of steel with light cuts.

Car Holder Announced

A new safety block, or car holder, designed for holding trips on bad grades, has recently been introduced by the Portable Lamp & Equipment



Co., 77 First Ave., Pittsburgh, Pa. Small, light in weight and in one piece, the device can be placed in position for use in several seconds.

In operation, Portable's Safety Block is placed on the rail next to either a wood or a steel tie. When car wheel strikes holder, the device rests against tie for support. Although introduced primarily for holding trips on grades, it may be employed with equal success as a "face stop."

Carried in stock in two sizes, for 20 to 25 lb. and for 30 to 35 lb. rail, the device is guaranteed for six months against breakage in use.

A New Air Circuit Breaker for Repetitive Duty

Designed especially for use in industrial, central station, or power plants where operation under repetitive duty cycles is required, a new and compact circuit breaker is announced by the Westinghouse Electric and Manufacturing Company. The new type DK breaker is available in 15,000 and 25,000 ampere interrupting capacities in all standard current ratings from 15 to 600 amperes for operation on one, two, three, or four pole 600 volts a-c or 250 volts d-c circuits.

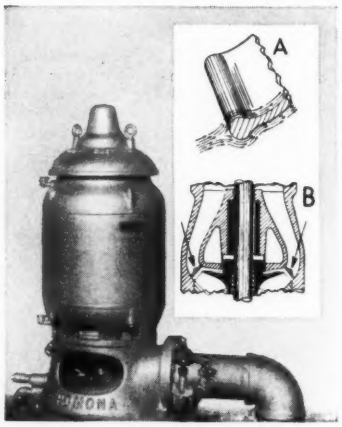
The new breakers are equipped with a rotary type, removable operating handle for controlling the breaker manually. In addition electric operation can be provided by a motor mechanism and a shunt trip. The motor operating mechanism is a single enclosed unit in itself. It can be removed by taking out only three bolts. Main contacts are of silver alloy and employ a self-wiping action. "De-Ion" arc quenchers minimize burning on the main and the arcing contacts.

These breakers are available in four different forms; an open-type and three forms for enclosed applications. The standard enclosed breaker consists of an open-type unit mounted in a sheet-metal housing. Studs are exposed at the rear when mounted on existing framework, or switchboards, or other apparatus where only the front needs to be enclosed. The second enclosed type is similar except that a pull box for wall mounting is included. Third type is for use when the breaker is to be mounted on a flush type dead front switchboard.

Improved Pomona Pumps

The Pomona Pump Co., St. Louis, Mo., and Pomona, Calif., has recently been granted patents covering design improvements which eliminate hydraulic losses in pumps, thereby increasing efficiency as much as 10 percent. These improvements, now included in all sizes of Pomona Vertical Turbine Pumps, involve fundamental design changes in the guide vanes, function of which is to alter, from horizontal to vertical, the flow direction of fluids being pumped.

Previous practice in pump manufacture dictated that these guide vanes can be constructed as thin as possible on the advance edge, on the theory that the less metal the fluid would strike, the less would be the resistance encountered. However, it was discovered by Pomona engineers that, because fluid being discharged by the impeller element flows across



the guide vanes at various angles (instead of always directly across the advance edge), eddy-friction losses are encountered, reducing the efficiency of the pump.

By forming these advanced vane ends of a bulbous shape, it was discovered that regardless of the flow direction of the fluid, its direction would always be substantially tangential to the vane surface. Thus, greater uniformity of flow pattern is secured, friction is reduced and efficiency of fluid lift is increased. Furthermore, because of the recessive curve at the rear of the bulb-shaped vane, eddy currents are not developed as under former circumstances.

The improvement is inherent in the pump design, so that there are no gadgets or small parts to wear out. The new vane shape increases over-all operating efficiency as much as 10 percent, with no increase in the original investment, and in addition permits the high efficiency to be maintained over a broader range of capacities than is possible with ordinary turbine pumps. Moreover, the broader guide vanes give increased strength because of their extra thickness.

Inasmuch as the new guide vanes are an inherent part of the pump bowl assembly, it is not necessary for the owner of a vertical turbine pump to purchase a complete new pump in order to take advantage of the new design. It is only necessary to substitute a new bowl assembly.

Portable Acetylene Generator

A new portable acetylene generator for use in oxy-acetylene welding and cutting has just been announced by the Linde Air Products Co., a unit of Union Carbide and Carbon Corp. This generator, known as the Oxweld MP-10, will deliver 30 cu. ft. of acetylene per hour and is suitable for welding metal up to ⅜-in. thick, and for cutting steel up to 5-in. thick. It is designed for maximum portability, from a standpoint of weight and height, and can readily be moved about the shop or away from the shop for outside jobs. The generator can be recharged speedily, and is simple and easy to operate.

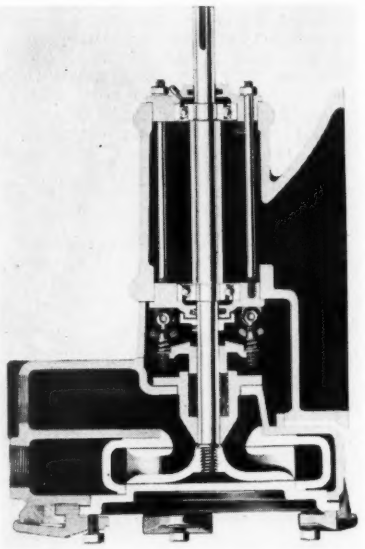
Generation of acetylene is started, set for regular operation, and stopped, by rotating the single pair of operating handles at the top of the generator. Once the operating handles have been set, generation of acetylene proceeds automatically. The pressure of acetylene delivered to the blowpipe is controlled by a regulator which forms an integral part of the generator, and a separate pressure gauge indicates at all times the pressure within the generating chamber.

Other construction features of the

MP-10 generator include two relief valves which automatically vent any excessive pressures that should develop within the generator or in the delivery hose, and a hydraulic backpressure valve which, by providing a water seal between the hose and generator, prevents any reverse flow of gas.

Amsco-Nagle Horizontal Industrial Pumps Now in Production

Following up the introduction, at the beginning of the year, of the Amsco-Nagle Vertical Shaft Pumps, the American Manganese Steel Division of the American Brake Shoe & Foundry Co., Chicago Heights, Ill., is now in production on Amsco-Nagle Horizontal Shaft Pumps, rounding out the new line of industrial pumps.



Designated Types "A" and "T," the new horizontal pumps are available in all sizes from ¾-in. to 6-in. in capacities up to 1400 g.p.m. and for operating heads up to 100 ft. A variety of materials is used in the construction of these pumps, the choice depending upon the extent of the abrasion or corrosion under which the pump will operate; such metals as manganese steel, chromium-nickel alloys, white iron, nickel-iron, brass, bronze and other cuprous alloys.

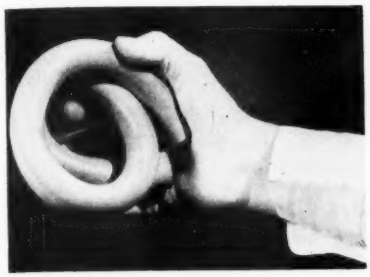
The maker states that the new Type "A" and "T" pumps feature clamp-bolt construction of the water end, a bearing arrangement that assures proper alignment, sealed bearings, a readily accessible stuffing box and self-priming features. Four types of impellers are available—2, 4 and 6-vane shrouded type and 4-vane open type.

Neutral Grounding Resistor For Shovel Service

A line of noncorrodible neutral grounding resistors for outside service, designed particularly for application where dirt, fumes, and extreme weather conditions are encountered, has been announced by the General Electric Company of Schenectady, N. Y.

Air Hose Can Be Bent To Radius Of 3 Inches Without Cutting Supply

A new lightweight air hose so flexible that the ½-in. size can be bent to a 3-in. radius without collapsing or cutting off the air supply is announced by The B. F. Goodrich Company, Akron, Ohio.



The hose has been designed so that strength and efficiency are combined with minimum weight and ease of handling and should have particular appeal to shop men handling pneumatic tools, the company's announcement says.

Made in a light gray which stands out prominently and is easy to see by the operators of shop trucks, the new hose is stocked in ½- and ¾-in. sizes. Of two-braid construction, the hose can easily withstand working pressures of from 80 to 125 lbs.

Compound of the tube is of oil-resistant rubber, with excellent heat-resisting characteristics. The tube does not flake or clog tools. Yarn reinforcement affords a safety factor of more than five to one under a working pressure of 125 lbs., while the golden ply insulation has been especially developed to assist in flexibility and resistance to kinking.

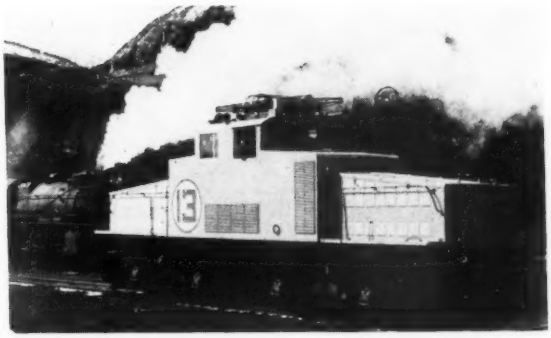
New Industrial Multi-Breaker

A new 230-volt industrial multi-breaker—at little more than the cost of a type A switch—is announced by Cutler-Hammer, Inc.

This new breaker affords exceptionally economical application as a motor circuit switch or service disconnect switch. It is fuseless, with bi-metallic strip actuation, visible trip indication, and trip free lever. It is quick make and quick break, with a rated capacity of 230 volts from 15 to 100 amperes, available in 3 pole, 3 pole solid neutral or 4 pole solid neutral types. Calibration is set at the factory and cannot be tampered with. The breaker is completely enclosed and semi-dust-tight. Front access and operation make this breaker convenient, compact and economical of space.

Peerless Pump Moves

The Peerless Pump Division of the Food Machinery Corporation has announced the completion and removal of its eastern offices and manufacturing facilities from Massillon, Ohio, to a new and modern plant located at 1250 Camden Avenue, S. W., Canton, Ohio.



One of nine 125-ton electric locomotives, the largest combination trolley-battery locomotives ever built for open pit mining service, during its trial run at the East Pittsburgh Works of the Westinghouse Electric and Manufacturing Company. Six of these units have already been shipped to the Morenci mine of Phelps Dodge Corp.

CATALOGS AND BULLETINS

• BEARINGS. *Ahlberg Bearing Co.*, 3025 W. 47th Street, Chicago, Ill. The company has issued an Application Manual, No. 3 MM, which gives the sizes and types of bearings for mining machinery. Included is a long list of mining machinery made by various manufacturers, together with the catalog numbers of Ahlberg bearings to be used on various parts of the machine.

• CRUSHERS. *Traylor Engineering & Mfg. Co.* The Traylor Company recently announced the publication of a new bulletin No. 3112, of 22 pages, describing the features and application of the Type TY Reduction Crusher. Engineering data are included.

• EARTH MOVING MACHINERY. *Bucyrus-Erie Co.*, South Milwaukee, Wis. Recently announced was the publication of two new specification sheets covering the new "Grubber" and the new S-152 17-yard scraper, both of which are additions to the company's line of tractor equipment. The "Grubber" is for use in clearing and grubbing operations. The S-152 scraper is one of the largest four-wheel scrapers offered for operation with either a single tractor of large size or with a tractor of smaller size using a pusher tractor at the loading point.

• GLOBE AND ANGLE VALVES. *The Reading-Pratt & Cady Division of the American Chain & Cable Company, Inc.*, Reading, Pa. A new folder which may be secured upon request has been published on Union Bonnet Bronze Globe and Angle Valves. This folder covers the new improvements in this line of valves. Three types of seatings are available, regrinding, semi-plug, and full plug, as well as three seating materials, bronze, copper, nickel alloy, and stainless steel (12-14 percent chromium). Steam pressure ratings range from 150 pounds with temperature ratings up to 550 degrees Fahrenheit.

• LIFTING JACKS. *Duff-Norton Manufacturing Co.*, Pittsburgh, Pa. Catalog 200, a newly revised data book on industrial jacks, has just been issued by the company. It contains 64 pages of useful reference material and the book lists equipment for every type of lifting, lowering, pushing and pulling application, including mine roof and mine timber jack service. Specifications are given on the complete line of over 300 types and sizes of jacks.

• LUMP COAL BREAKER. *McNally-Pittsburg Mfg. Corp.*, 307 N. Michigan Ave., Chicago, Ill. Recently issued is a folder describing the performances and results of breaking lump coal in the McNally-Norton Vertical Pick Breaker. Bulletin No. 241-2.

• OIL CIRCUIT BREAKERS. *Westinghouse Electric & Mfg. Co.*, East Pittsburgh, Pa. Upon request to department 7-N-20, the company will send a copy of Descriptive Data 33-216 on oil circuit breakers for indoor service, a new 8-page bulletin. The breakers are rated 25,000 kva interrupting capacity, manually and electrically operated for applications up to 6,000 amperes, 7,500 volts, and 800 amperes, 5,000 volts, 2 and 3 pole.

• SMALL ELECTRIC DRILLS. *Independent Pneumatic Tool Co.*, 600 W. Jackson Blvd., Chicago, Ill. "The Fast, Modern Way to Drill," is the subject of a new bulletin issued by the company showing the latest U14 type ¼-in. capacity, small, light, one-hand electric drills. The bulletin contains six pages of information and specifications on THOR ¼-in. portable electric drills for every industrial application, and the circular presents the complete range of models, motor sizes, speeds and switch styles. Circular No. JE-112.

• STOPERS. *The Cleveland Rock Drill Co.*, 3734 E. 78th St., Cleveland, Ohio. The company recently issued bulletin No. 129 on the new Model SS22 Stoper, and bulletin No. 130, which describes the Models D24 and PD24 Drifters.

• VIBRATING SCREENS. *Productive Equipment Corporation*, 2926 West Lake St., Chicago, Ill. A new bulletin No. 441 has been issued on the use of Selectro Vibrating Screens for the processing of coal. The bulletin describes the features of the screen and gives dimensions and engineering data in connection therewith.

• WEIGHT RECORDING FEEDERS. *Hardinge Co.*, York, Pa. Bulletin 43 illustrates and describes company's "feedometer" used for recording the weight fed from a bin to railroad cars, especially where two or more products are to be incorporated and blended simultaneously. 4 pages.

INDEX TO ADVERTISERS

American Chain & Cable Co., Inc. ..... Third Cover
American Cable Division

American Cyanamid Co. 10-11

Bethlehem Steel Co. 12

Deister Concentrator Co., The 61

Du Pont de Nemours & Co., Inc., E. I. 8

Gardner-Denver Co. 46

Goodman Manufacturing Co. 1

Hercules Powder Co. 4

Hoffman Bros. Drilling Co. 68

I-T-E Circuit Breaker Co. 46

Jeffrey Manufacturing Co., The 3

Joy Manufacturing Co. 6-7

Koppers Co. 5
Wood Preserving Division

Link-Belt Co. 14

Loftus, Peter F. 62

Metal & Thermit Corp. ..... Second Cover

Mott Core Drilling Co. 68

Ohio Brass Co. 63

Pennsylvania Drilling Co. 68

Roberts & Schaefer Co. 13

Robinson Ventilating Co. 68

Roebling's Sons Co., John A. 9

San Francisco Convention & Tourist Bureau, Back Cover

Union Wire Rope Corp. 46

Universal Vibrating Screen Co. 68

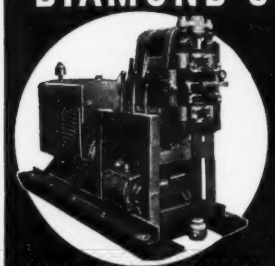
Young, L. E. 62

ROBINSON
VENTILATING COMPANY
•
Fans and Blowers
Ventilating Engineering Service
•
ZELIENOPLE
PENNSYLVANIA

Established 1902
HOFFMAN·BROS·DRILLING·CO.
CONTRACTORS
DIAMOND CORE DRILLING
PUNXSUTAWNEY, PA.
Our specialty—Testing bituminous coal lands
Satisfactory cores guaranteed

UNIVERSAL
VIBRATING SCREENS
Have that powerful elliptical screening action that keeps screen mesh free from blinding, producing sharp separations and largest capacity.
Write for data on latest improved Screen Models
No obligations whatever
UNIVERSAL VIBRATING SCREEN CO.
RACINE ~ ~ WISCONSIN

DIAMOND CORE DRILLING
CONTRACTORS
TESTING COAL AND ALL MINERAL PROPERTIES - USING OUR LIGHT GASOLINE DRILLS.. THEY SAVE FUEL AND MOVING COSTS..WE GUARANTEE SATISFACTORY AND PROPER CORES..
PRE-PRESSURE GROUTING FOR MINE SHAFTS... GROUND SOLIDIFICATION FOR WET MINE AREAS BY OUR STOP GROUT METHOD. WATER WELLS AND DISCHARGE HOLES DRILLED AND GROUTED... ELECTRIC DRILLS FOR INSIDE MINE DRILLING..



1200 FT. CAP. 2¼ DIAMETER CORE
MOTT CORE DRILLING CO.
HUNTINGTON, W. VA.

We Look Into the Earth
By using Diamond Core Drills. We prospect Coal and Mineral Lands in any part of North or South America.
Pennsylvania Drilling Co.
Pittsburgh, Pa.
Drilling Contractors

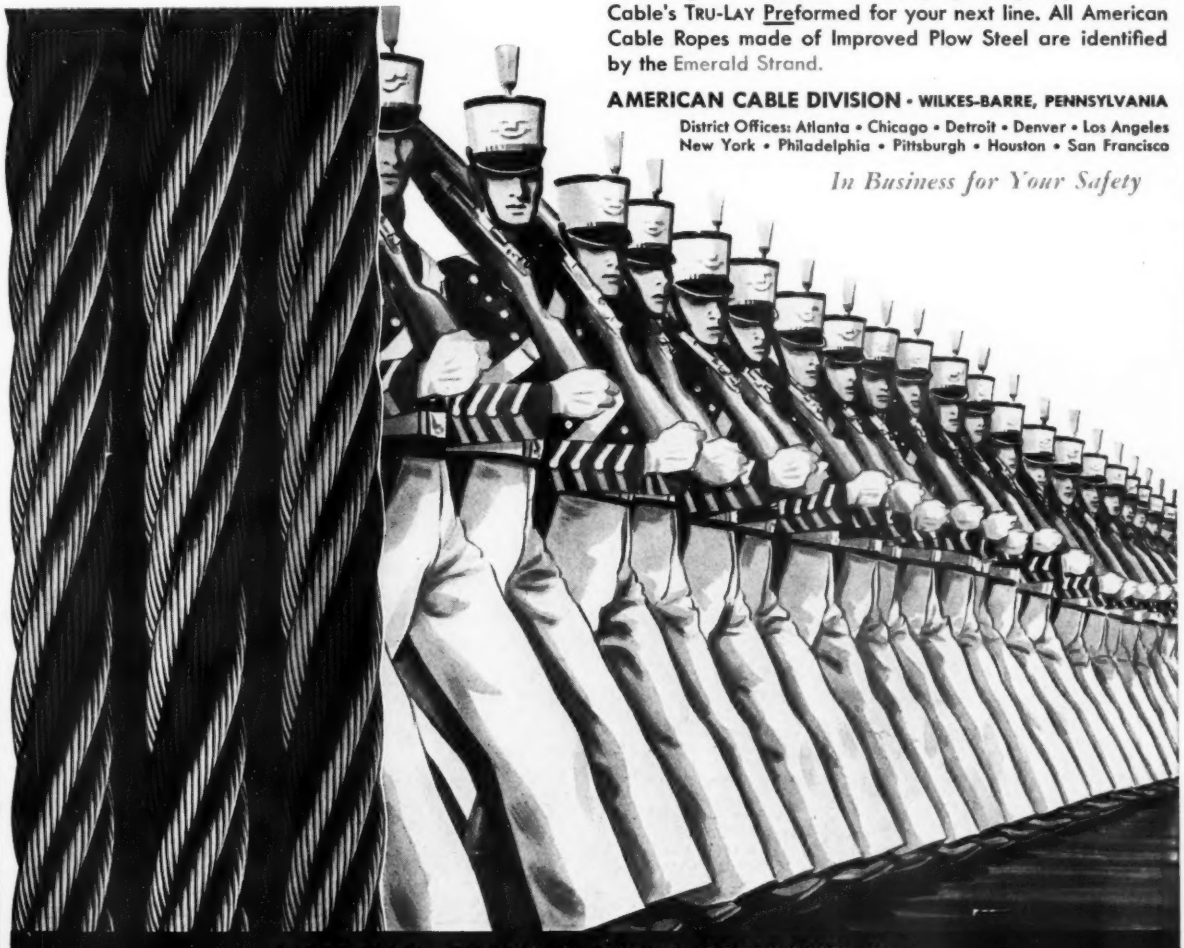
AMERICAN CABLE

TRU-LAY *Preformed* Wire Ropes ARE UNIFORM

UNIFORM IN QUALITY This is a universally acknowledged characteristic of American Cable's Wire Ropes.

UNIFORM IN SERVICE Being uniform in quality, American Cable's Ropes are naturally uniform in service. When American Cable introduced TRU-LAY Preformed, in 1924, we gave all industry a rope that far outlasted ordinary non-preformed, our own make included. Here, too, in increased service, there is uniformity for when one TRU-LAY Preformed Rope does a job unusually well, the second or twenty-second TRU-LAY Rope will do equally well.

UNIFORM IN SAFETY TRU-LAY Preformed is a safer rope. Its crown wires lie flat and in place so that there is less danger of their wickering out and jabbing workmen's hands, which often causes blood-poisoning. TRU-LAY handles easier and faster, resists kinking and whipping, spools on drums better and rotates less in sheave grooves. TRU-LAY requires no seizing when cut and will not fly apart. Specify American Cable's TRU-LAY Preformed for your next line. All American Cable Ropes made of Improved Plow Steel are identified by the Emerald Strand.



AMERICAN CABLE DIVISION • WILKES-BARRE, PENNSYLVANIA

District Offices: Atlanta • Chicago • Detroit • Denver • Los Angeles
New York • Philadelphia • Pittsburgh • Houston • San Francisco

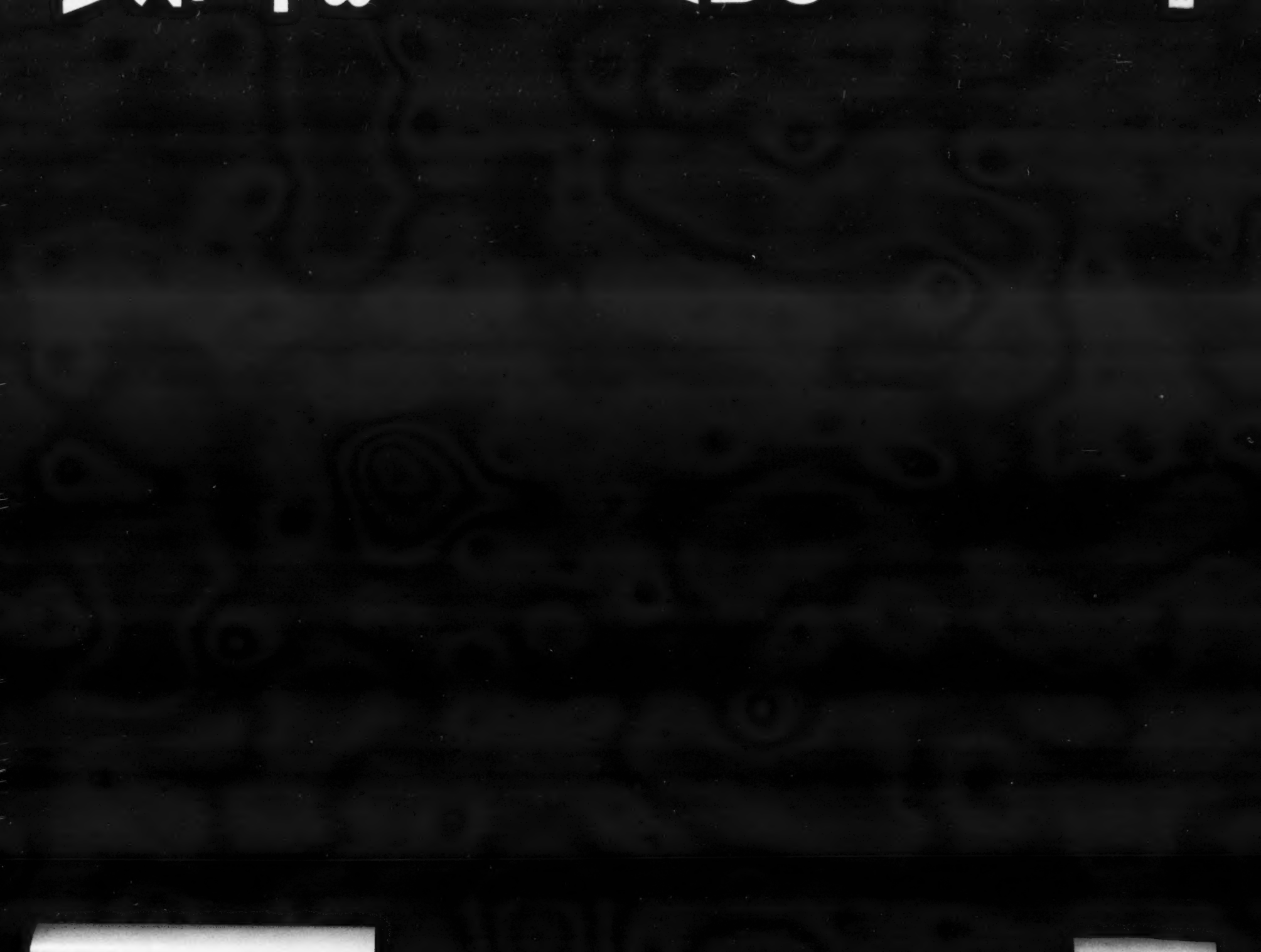
In Business for Your Safety

AMERICAN CHAIN & CABLE COMPANY, Inc.

ESSENTIAL PRODUCTS . . . AMERICAN CABLE Wire Rope, TRU-STOP Emergency Brakes, TRU-LAY Control Cables, AMERICAN Chain, WEED Tire Chains, ACCO Malleable Iron Castings, CAMPBELL Cutting Machines, FORD Hoists and Trolleys, HAZARD Wire Rope, Yacht Rigging, Aircraft Control Cables, MANLEY Auto Service Equipment, OWEN Springs, PAGE Fence, Shaped Wire, Welding Wire, READING-PRATT & CADY Valves, READING Electric Steel Castings, WRIGHT Hoists, Cranes, Presses . . . *In Business for Your Safety*

The City by the Golden Gate Awaits Your VISIT for the METAL Mining Convention and Exposition of the American Mining Congress

San Francisco Convention Committee

SAN FRANCISCO, CALIFORNIA

September 29 - October 2, 1941